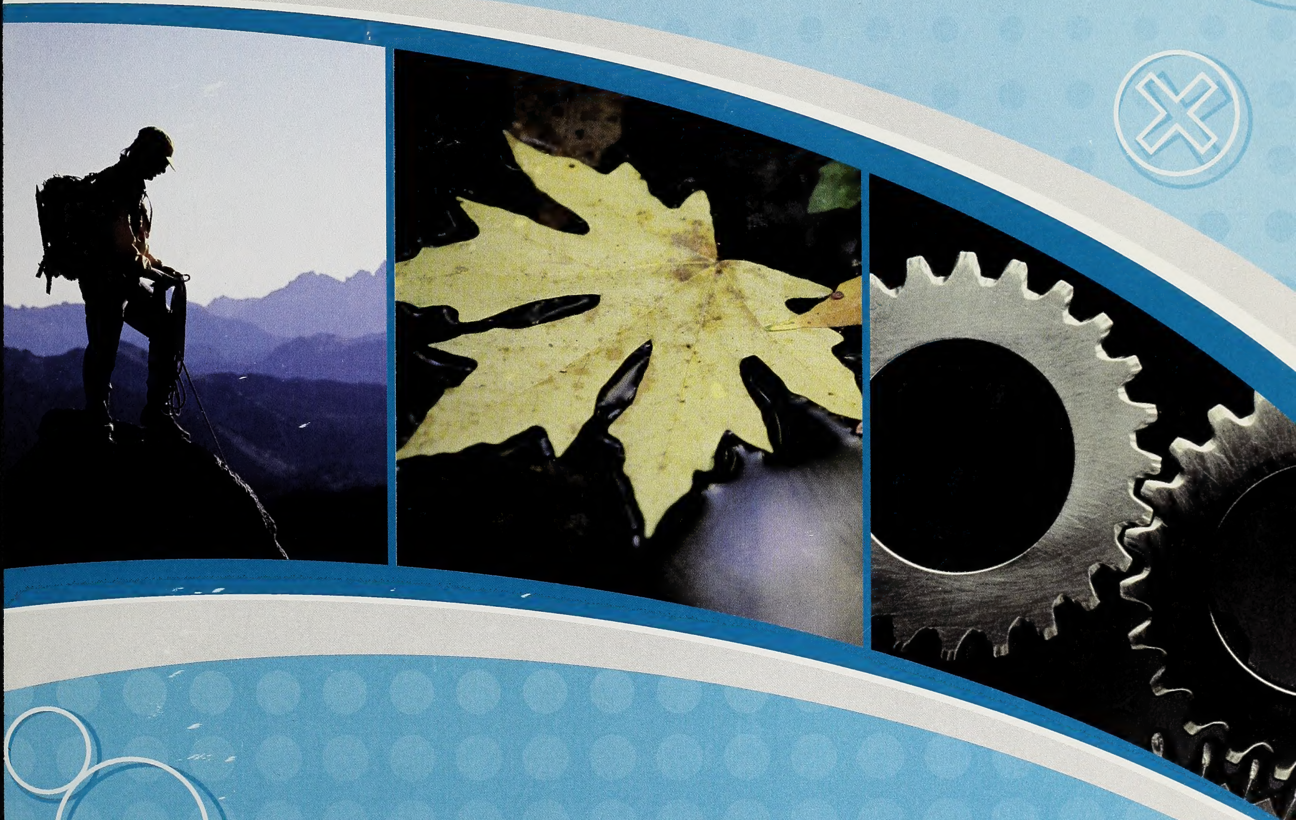
3

# MATHEMATICS 14



## Module 3
## FRACTIONS, RATIO, and PERCENT

Learning Technologies Branch

Alberta LEARNING

# MATHEMATICS 14

## Module 3
### FRACTIONS, RATIO, and PERCENT

Mathematics 14
Module 3: Fractions, Ratio, and Percent
Student Module Booklet
Learning Technologies Branch
ISBN 0-7741-2531-4

**The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Student Module Booklet.**

| This document is intended for | |
|---|---|
| Students | ✓ |
| Teachers | ✓ |
| Administrators | |
| Home Instructors | |
| General Public | |
| Other | |

You may find the following Internet sites useful:

- Alberta Learning, **http://www.learning.gov.ab.ca**
- Learning Technologies Branch, **http://www.learning.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.learning.gov.ab.ca**

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

Welcome to

# MATHEMATICS 14

Mathematics 14 contains five modules. You should work through the modules in order (from 1 to 5) because concepts and skills introduced in one module will be reinforced, extended, and applied in later modules.

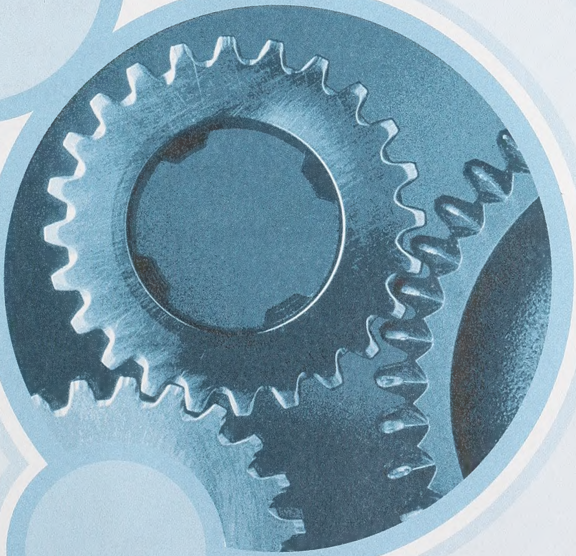
**Module 1**
NUMBER

**Module 2**
PATTERNS and EQUATIONS

**Module 3**
FRACTIONS, RATIO, and PERCENT

**Module 4**
MEASUREMENT

**Module 5**
GEOMETRY

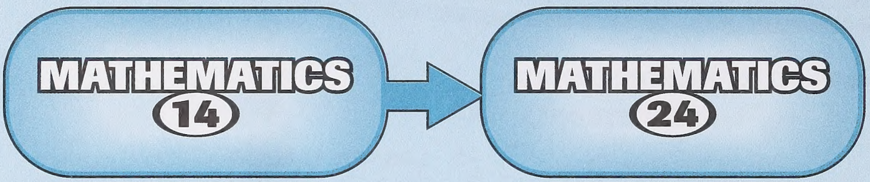


# CONTENTS

# COURSE FEATURES

## The Mathematics 14–24 Program

Mathematics 14 is the first course in the Mathematics 14–24 sequence of courses. If you successfully complete each of these five-credit courses, you will meet the minimum requirements in mathematics for an Alberta high school diploma.




The Mathematics 14–24 sequence is designed for students whose needs, interests, and abilities focus on basic mathematical understanding. This course sequence emphasizes the acquisition of practical life skills and proficiency in using mathematics to solve problems, adapt to change, interpret information, and build on previous knowledge.

Consult your teacher or counsellor for the latest information. Also, if you have access to the Internet, you can find out more about Mathematics 14 and high school requirements at the Alberta Learning website.

**http://www.learning.gov.ab.ca**

Take the time to look through the Student Module Booklets and the Assignment Booklets and notice the following design features:

- Each module has a Module Overview, Module Summary, and Review.
- Each module has several sections. Each section focuses on a big idea that is central to the topic being learned in the module.
- Each section has several lessons.
- Each module has a Glossary and an Answer Key in the Appendix. In several modules there are also special pull-out pages in the Appendix.
- Each module references the CD that accompanies your *Continuum* textbook.

## Required Resources

There are no spaces provided in the Student Module Booklets for your answers. This means you will need a binder and loose-leaf paper or a notebook to do your work.

In order to complete the course, you will need a copy of the Mathematics 14 textbook, *Continuum*, a scientific calculator (such as the Texas Instruments TI-30X IIS), and various manipulatives (pattern blocks and fraction blocks). For your convenience, cut-out fraction blocks are provided in the Appendix of Module 3.

Pattern blocks and fraction blocks are available from the Learning Resources Centre. As of 2003, the product codes for these items were 161901 and 408288, respectively. Check for the latest ordering information at the LRC website.

**http://www.lrc.learning.gov.ab.ca**

If you wish to complete the optional computer activities, you must have access to a computer that is connected to the Internet.

You will also need access to a computer to view material on the CD-ROM that accompanies your *Continuum* textbook.

## Visual Cues

For your convenience, the most important mathematical rules and definitions are highlighted. Icons are also used as visual cues. Each icon tells you to do something.


Refer to the *Continuum* CD-ROM.


Use the Internet.


Refer to the textbook.

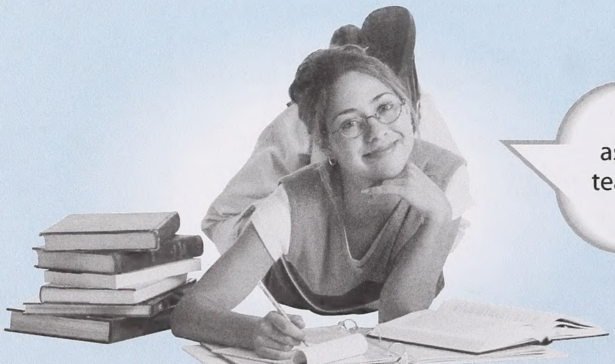

Use your calculator.

# ASSESSMENT AND FEEDBACK

The Mathematics 14 course is carefully designed to give you many opportunities to discover how well you are doing. In every lesson you will be asked to turn to the Appendix to check your answers. Completing the lessons and comparing your answers to the suggested answers in the Appendix will help you better understand math concepts, develop math skills, and improve your ability to communicate mathematically and solve problems.

If you are having difficulty with a lesson, refer to the Answer Key in the Appendix for hints or help. As well as giving suggested answers to the questions, the Answer Key gives you more information about the questions.

Twice in each module you will be asked to give your teacher your completed assignments to mark. Your teacher will give you feedback on how you are doing.



After your teacher marks an assignment, be sure to review your teacher's comments and correct any errors you made.

There will be a Final Test at the end of the course. You can prepare for the Final Test by completing the Review at the end of each module.

# MODULE OVERVIEW


If you have ever been part of a relay team, you know how important it is to practise hard. You also know how important it is to have good teamwork. If your team can shave just a fraction of a second off your time, you might win the race; but, if you are even a hundredth of a second too slow, you could lose.

How fast do you think you would have to run to win a race? Would it be 30 km/h, or possibly even faster? How many people your age can run 30 km/h for a short time? Would it be 5% or less?

In this module you will learn about fractions, rates, percents, and proportions.

**Module 3**
**FRACTIONS, RATIO, and PERCENT**

**Section 1**
**FRACTIONS**

**Section 2**
**RATIOS, RATES, and PERCENTS**

Your mark on this module will be determined by how well you complete the two Assignment Booklets.

The mark distribution is as follows:

| | |
|---|---|
| **Assignment Booklet 3A** | |
| Section 1 Assignment | 40 marks |
| **Assignment Booklet 3B** | |
| Section 2 Assignment | 40 marks |
| Final Module Assignment | 20 marks |
| Total | 100 marks |

When doing the assignments, work slowly and carefully. Be sure you attempt each part of the assignments. If you are having difficulty, you may use your course materials to help you, but you must do the assignments by yourself.

You will submit Assignment Booklet 3A to your teacher before you begin Section 2. You will submit Assignment Booklet 3B to your teacher at the end of this module.

# SECTION 1

## Fractions

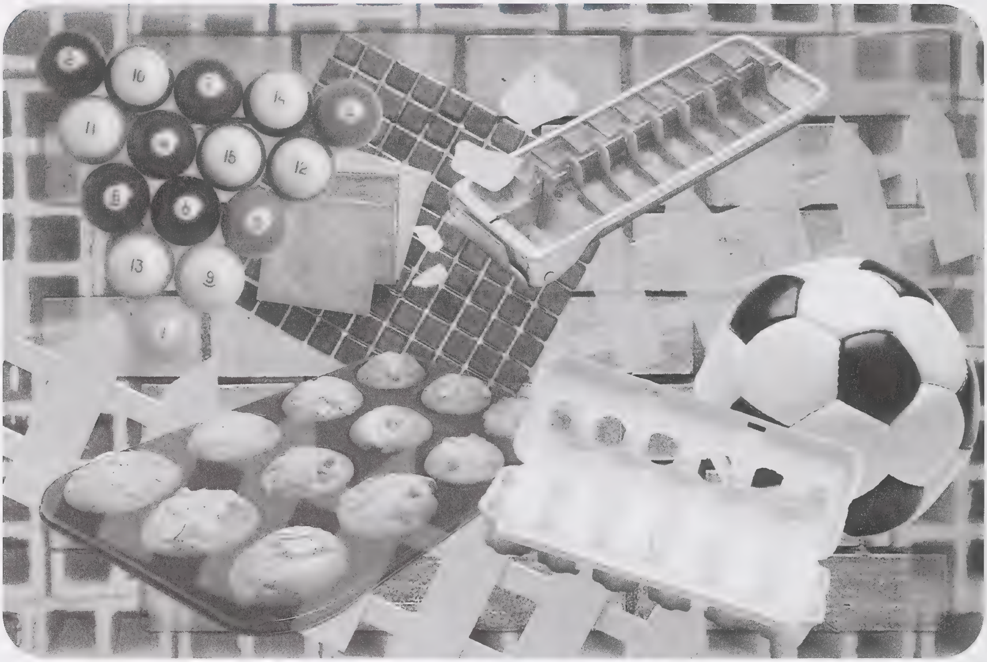
Some pine trees can grow to be over 60 m tall. It would be difficult to fit one into your fireplace; unless, of course, you cut it up into smaller parts. This is true for a lot of other things, too. Think about the huge roll of paper that your textbook came from. Do you think you could lift it? Dividing big things into smaller parts is extremely common—you see it everywhere.

In mathematics, fractions are used to represent parts of objects. In the real world, you often group parts together to make new objects. At other times, you need to take a whole lot of small things to make something useful (like a paving-stone driveway). These actions have their equivalents with fractions, and you will be learning all about them in Section 1.

# LESSON 1

## What Is a Fraction?

Today you will examine what a fraction is.



As you walk home from school, you pass the neighbour's coloured panel fence. You glance up at the shingles on the house across the street. You run up the stairs. You take off your shoes in the tiled entryway and scoot into the family room to sit down on the couch. You notice the sun is setting through the multi-paned window.

In each case, did you think of the smaller parts that come together to form the whole object? The smaller parts are fractions of the entire object. You experience fractions around you every day. They are so common that most of them get missed.

You will begin this lesson by reviewing ideas from previous math courses.

# Looking Back

Turn to pages 122 and 123 in your textbook. Read through the questions in "Investigation."

Here is an example of the work you are about to do.

## Example

The RAW POWER poster on page 122 has one dimension of 23 cm. This matches one dimension of a 38 cm-by-23 cm envelope. The other dimension of the poster is 76 cm. You must fold the poster to fit into the envelope. Only one fold is needed to make the poster fit the envelope $(\text{since } 76 \div 2 = 38)$. This makes the folded poster half of its original size.

| Poster | Which Envelope? | Sketch of Poster Showing Fold Lines | Folded Poster Is What Fraction of Original Size? |
|---|---|---|---|
| A | 38 cm by 23 cm |  | $\frac{1}{2}$ |

**1.** Do questions 1 to 3 of "Investigation."

Check your answers on pages 73 and 74 in the Appendix.

Remember that the solutions in the Appendix are good examples. Even if you find the questions easy, look at the solutions. They show you a complete and correctly solved question. They provide a model for how you should solve problems.

In “Investigation,” you reviewed the idea that a **fraction** is a part of a whole. You will use this definition in the following examples.

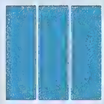
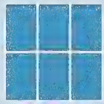
## Example

A square is divided into 4 equal parts. What fraction of the square does 1 part represent?


One part of a square that is divided into 4 parts is $\frac{1}{4}$ of the whole square.

## Example

How many parts make up each of the following squares? One part makes up what fraction of each square?

| **Square** |  |  |  |
|---|---|---|---|
| **Number of Parts** | 4 | 3 | 6 |
| **Name of the Fraction Representing 1 Part** | 1 part out of 4<br>$\frac{1}{4}$ | 1 part out of 3<br>$\frac{1}{3}$ | 1 part out of 6<br>$\frac{1}{6}$ |

Did you notice the following things about fractions?

The number of parts in the whole falls to the bottom of the fraction. 4

The chosen number of parts rises to the top of the fraction. 1

$\frac{1}{4}$

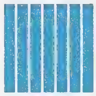
Turn to page 124 in your textbook. Read the questions in “Put into Practice.”

Here are examples of the work you are about to do.

## Example

How many sevenths are in a whole?

An object divided into sevenths is divided into 7 equal parts. There are 7 sevenths in 1 whole.



## Example

State the value of ? when $\frac{?}{4} = 1$.

An object is divided into 4 equal parts. It takes 4 parts to make the object. The whole object is 4 parts out of 4, or $\frac{4}{4} = 1$.
? must be 4.

## Example

What fraction of a loonie is 50¢?

A loonie is 100¢. So, 50¢ is $\frac{50}{100}$ of a loonie.

A loonie is a dollar. 50¢ is a half dollar. So, 50¢ is $\frac{1}{2}$ of a loonie.

There are many different ways to write a fraction. Generally, you should write fractions using the smallest numbers possible. For this question, the best answer is $\frac{1}{2}$.

**2.** Turn to page 124 in your textbook. Do questions 1 to 3 of “Put into Practice.”

Check your answers on pages 74 and 75 in the Appendix.

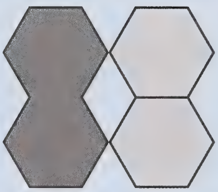
Take out your coloured pattern blocks. You will be using them throughout the rest of this section. If you don't have pattern blocks, remove the pages of paper pattern blocks from the Appendix of this module. Carefully cut them out and put them into an envelope so you don't lose them.

Turn to page 125 in your textbook and read the questions in "Investigation."

Here is an example of the work you are about to do.

### Example

Cover the pink double hexagon with yellow hexagons.

| Shape Used to Cover Double Hexagon | Diagram | Number of Shapes Needed to Cover It | Fraction Represented By | |
|---|---|---|---|---|
| Hexagon |  | 2 | 1 hexagon<br>$\frac{1}{2}$ | 2 hexagons<br>$\frac{2}{2}=1$ |

3. Turn to page 125 in your textbook. In your notebook, copy and complete a table like the one in "Investigation."

Check your answer on page 76 in the Appendix.

Some special terms are used when discussing fractions. Read the text in the box at the bottom of page 125.

The terms **denominator** and **numerator** are important when discussing fractions.

$$\frac{\text{numerator}}{\text{denominator}}$$

4. Turn to page 126 in your textbook. Do questions 4 to 6 of "Put into Practice."

Check your answers on pages 76 and 77 in the Appendix.

Earlier you saw $\frac{50}{100}$ expressed in a simpler way as $\frac{1}{2}$. Mathematicians like to make things simple. Sometimes this requires special names for things. Turn to page 126 in your textbook. Read the text in the box in the middle of the page. You will discover two new terms for describing fractions. You will use the terms **proper fraction** and **improper fraction** in the following question.

5. Answer question 7 of "Put into Practice" on page 126 in your textbook.

Check your answer on page 77 in the Appendix.

In this lesson you learned about proper and improper fractions. The following website provides a simple review:

**http://cne.gmu.edu/modules/dau/algebra/fractions/frac1_frm.html**

Turn to the Section 1 Assignment in Assignment Booklet 3A. Answer question 1.

# LESSON 2

## Mixed Numbers and Improper Fractions

Today you will work with mixed numbers and improper fractions.

When building a house, carpenters have to measure carefully. Not very many homeowners want a house full of odd-shaped rooms! You expect the walls to be straight and the same height in every room. Many of the measurements used by carpenters use fractions.

For example, wall studs are commonly $1\frac{1}{3}$ feet apart. Some doors measure $6\frac{2}{3}$ feet tall and $2\frac{1}{2}$ feet wide. The fraction skills of carpenters help them build beautiful homes.

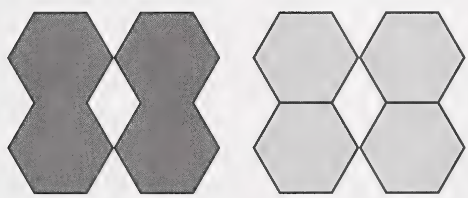
Turn to page 127 in your textbook. Start by reading the text in the coloured box on the left side of the page. You will be using **mixed numbers** in the next "Investigation." Then read the questions in "Investigation."

Here is an example of the work you will be doing. You should use the pattern blocks as you work through this example.

## Example

How many yellow hexagons does it take to cover 2 double hexagons?

It takes 4 yellow hexagons to cover the 2 double hexagons. This is shown in the following diagram.



## Example

Two wholes are the same as _____ halves.

$$2 = \frac{?}{2}$$

The diagram shows that 2 wholes are the same as 4 halves and $2 = \frac{4}{2}$.

1. Turn to page 127 in your textbook. Do questions 1 to 3 of "Investigation."

Check your answers on page 78 in the Appendix.

Turn to page 128 in your textbook. Read Example 1 in the coloured box. Use your pattern blocks to verify the solution.

## Example

Jasper is making two loaves of bread. The recipe he is using calls for $5\frac{1}{2}$ cups of flour. He only has a $\frac{1}{2}$-cup measure. How many times must he fill this $\frac{1}{2}$-cup to measure out $5\frac{1}{2}$ cups of flour?

Convert $5\frac{1}{2}$ from a mixed number to an improper fraction.

| | |
|---|---|
| $5\frac{1}{2} = 5 + \frac{1}{2}$ | A mixed number is the sum of a whole number and a fraction. |
| $= \frac{5 \times 2}{2} + \frac{1}{2}$ | Change the whole number to a fraction. |
| $= \frac{10}{2} + \frac{1}{2}$ | The 5 wholes become 10 halves. |
| $= \frac{11}{2}$ | The sum of $\frac{10}{2}$ and $\frac{1}{2}$ is $\frac{11}{2}$. |

The improper fraction $\frac{11}{2}$ (eleven halves) means Jasper needs to measure out 11 $\frac{1}{2}$-cups of flour.

The previous example examined the mixed number-improper fraction relationship. You will practise changing mixed numbers into improper fractions in the following questions.

2. Turn to page 128 in your textbook. Do questions 1 and 2 of "Put into Practice." Use your pattern blocks.

Check your answers on page 79 in the Appendix.

Turn to page 129 in your textbook. Study Example 2 at the top of the page. Use your pattern blocks to verify the solution.

Example 2 on page 129 also examines the mixed number-improper fraction relationship. The improper fraction $\frac{3}{2}$ was changed to the mixed number $1\frac{1}{2}$. You will practise changing improper fractions into mixed numbers in the following questions.

**3.** Turn to page 129 in your textbook. Do questions 3 and 4 of "Put into Practice." Your pattern blocks will be useful.

Check your answers on pages 79 and 80 in the Appendix.

Turn to page 130 in your textbook. Study Example 3 closely. You should model it using your pattern blocks. Then work through Example 4. Again, model the solutions using your pattern blocks. Did you notice how the number of wholes was changed into a number of halves?

## Example

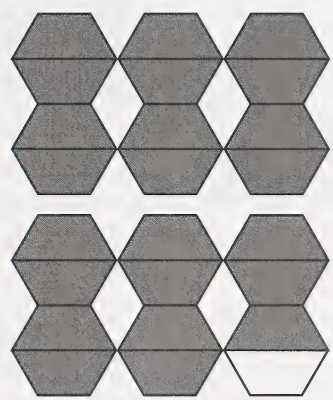
Change $5\frac{3}{4}$ into an improper fraction.

$5\frac{3}{4} = 5 + \frac{3}{4}$ — Think of a mixed number as the sum of a whole number and a fraction.

$= \frac{4 \times 5}{4} + \frac{3}{4}$ — Change the whole number into a fraction. Each whole is 4 quarters.

$= \frac{20}{4} + \frac{3}{4}$ — The 5 wholes become 20 quarters.

$= \frac{23}{4}$ — The sum of 20 quarters and 3 quarters is 23 quarters.



**4.** Turn to page 131 in your textbook. Do questions 6, 7, 8, and 10. In question 8, you are to keep two pieces of paper and the quarter that you tear off.

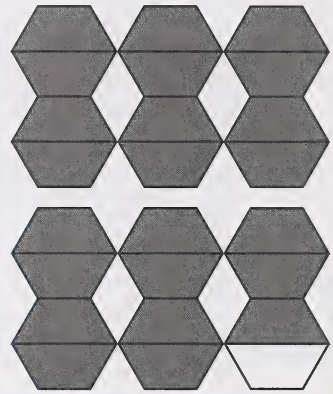
Check your answers on pages 80 to 82 in the Appendix.

### Example

Change $\frac{23}{4}$ into a mixed number.

Think of a fraction as division. You will find the largest whole number in the quotient and the number of quarters left over. These form the mixed number.

$\frac{23}{4}$ means $23 \div 4$.



$$\begin{array}{r l} 5 & \text{Number of wholes} \\ 4\overline{)23} & \\ -\ 20 & \text{Subtract the number of quarters in 5 wholes.} \\ \hline 3 & \text{Number of quarters left over} \end{array}$$

The mixed number is 5 wholes plus 3 quarters.

$$\frac{23}{4} = 5 + \frac{3}{4} \text{ or } 5\frac{3}{4}$$

Turn to page 132 in your textbook. Study Examples 5 and 6 closely. These examples use division to change improper fractions into mixed numbers. You will use division to change improper fractions into whole or mixed numbers in the following questions.

**5.** Turn to page 132 in your textbook. Do questions 11 and 12.

Check your answers on pages 83 to 86 in the Appendix.

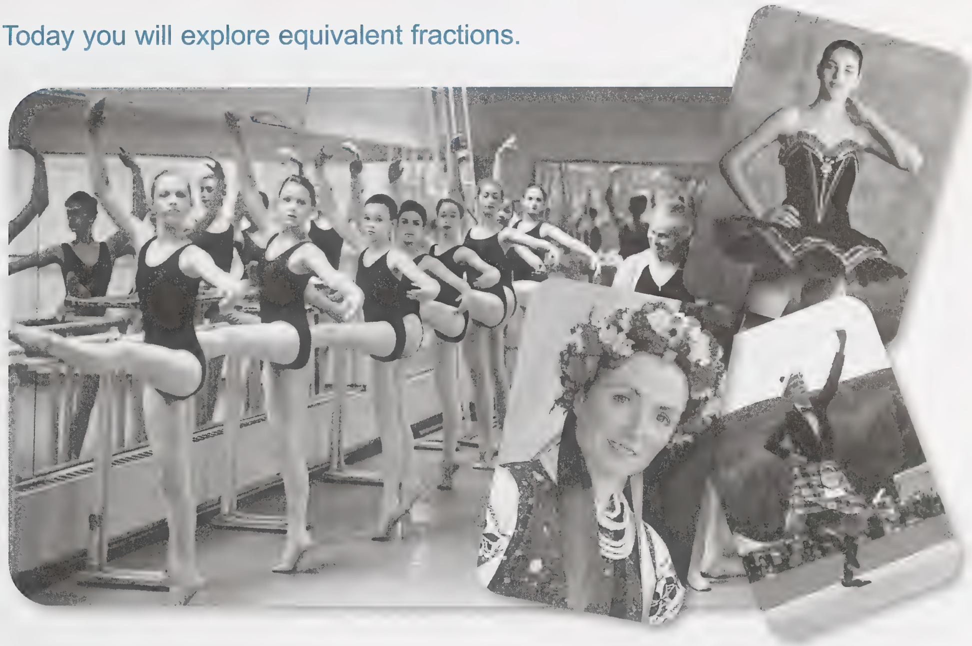
In this lesson you learned about mixed numbers and improper fractions.

Turn to the Section 1 Assignment in Assignment Booklet 3A. Answer question 2.

# LESSON 3

## Equivalent Fractions

Today you will explore equivalent fractions.



The dancers shown in the photos above are dressed quite differently. The care with which they chose their clothing was very much alike—they dressed in the manner that is appropriate to the dance they are performing. Although the costumes are different, they are chosen for similar reasons.

When you deal with fractions, they can also appear to be quite different, yet they are telling you the same information. In this lesson you will look at how fractions that look different can be the same.

Turn to page 133 in your textbook. Start by reading parts a. to e. of question 1 in "Investigation."

Several questions ask you to compare your answers with those of your classmates. If you are working alone, use the answers in the Appendix for this comparison. In many instances, different approaches will be presented.

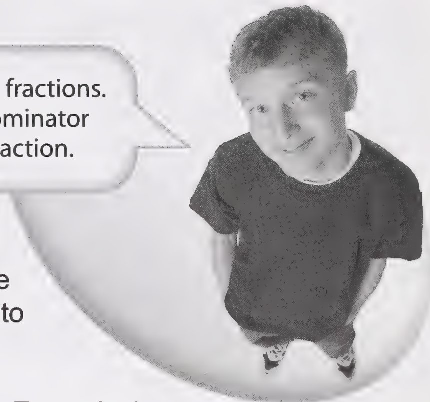
1. Turn to page 133 in your textbook. Do question 1 of "Investigation."

Turn to page 133 in your textbook. Read the definition in the coloured box on the left side of the page. You have been experimenting with **equivalent fractions**.

2. Turn to page 134 in your textbook. Do question 2 of "Investigation." You will get more experience with equivalent fractions.

Check your answers on pages 86 to 88 in the Appendix.

Turn to page 134 in your textbook. Read the information in the coloured box at the bottom of the page.




Turn to page 135 in your textbook. Read the information in the coloured box on the left side of the page. Sometimes you can use division to find equivalent fractions.

Continue on page 135 in your textbook. Study Example 1.
It shows a step-by-step process for changing a fraction to an equivalent fraction using multiplication.

## Example

Write four equivalent fractions for $\frac{3}{15}$.

Using the process from page 134 in your textbook will give equivalent fractions. Use the multipliers 2, 3, and 4.

**Multiplier 2**

$$\frac{3}{15} = \frac{2 \times 3}{2 \times 15} = \frac{6}{30}$$

**Multiplier 3**

$$\frac{3}{15} = \frac{3 \times 3}{3 \times 15} = \frac{9}{45}$$

**Multiplier 4**

$$\frac{3}{15} = \frac{4 \times 3}{4 \times 15} = \frac{12}{60}$$

You can find a simpler fraction using division. Both 3 and 15 have 3 as a divisor, so divide both the numerator and denominator by 3. (Division only works if the numerator and denominator have a common factor.)

$$\begin{aligned}\frac{3}{15} &= \frac{3 \div 3}{15 \div 3} \\ &= \frac{1}{5}\end{aligned}$$

Four equivalent fractions for $\frac{3}{15}$ are $\frac{1}{5}$, $\frac{6}{30}$, $\frac{9}{45}$, and $\frac{12}{60}$.

## Example

Calculate the value of ? in $\frac{3}{4} = \frac{?}{60}$.

You need to change from a fraction based on $\frac{1}{4}$. You need to change to a fraction based on $\frac{1}{60}$. The denominators are 4 and 60. Divide the larger denominator (60) by the smaller one (4).

$$\begin{array}{r} 15 \\ 4\overline{)60} \\ -\ 60 \\ \hline 0 \end{array}$$

Now you know that 15 is the multiplier to use.

$$\begin{aligned}\frac{3}{4} &= \frac{3 \times 15}{4 \times 15} \\ &= \frac{45}{60}\end{aligned}$$

The value of ? is 45.

## Example

Calculate the value of ? in $\frac{3}{5} = \frac{36}{?}$.

There are numbers in both numerators, so divide the larger numerator by the smaller one. This will give the multiplier to use.

$$\begin{array}{r} 12 \\ 3\overline{)36} \\ -\ 36 \\ \hline 0 \end{array}$$

When divisions are shown from now on, the subtraction signs will be omitted.

Now you know that 12 is the multiplier you should use.

$$\begin{aligned}\frac{3}{5} &= \frac{3\times12}{5\times12} \\ &= \frac{36}{60}\end{aligned}$$

The value of ? is 60.

**3.** Turn to page 135 in your textbook. Do questions 1 and 2 of "Put into Practice."

Check your answers on pages 88 to 92 in the Appendix.

Turn to page 136 in your textbook. Read the discussion in the coloured box at the top of the page. You will want to give the **simplest form** of a fraction when you answer questions.

Work through Example 2 on pages 136 and 137 in your textbook. This example shows you that simplifying fractions requires finding common factors.

## Example

Simplify $\frac{12}{28}$. Start by finding the factors of 12 and 78.

The factors of 12 are **1**, **2**, 3, **4**, 6, and 12. $(12 = 1\times12,\ 12 = 2\times6,\ 12 = 3\times4)$

The factors of 28 are **1**, **2**, **4**, 7, 14, and 28. $(28 = 1\times28,\ 28 = 2\times14,\ 28 = 4\times7)$

The common factors of 12 and 28 are **1**, **2**, and **4**. The largest common factor is **4**.

Divide both the numerator and the denominator by the largest common factor.

$$\begin{aligned}\frac{12}{28} &= \frac{12\div4}{28\div4} \\ &= \frac{3}{7}\end{aligned}$$

The simplest form of $\frac{12}{28}$ is $\frac{3}{7}$.

### Example

Write the simplest form of $\frac{6}{10}$.

The factors of 6 are **1**, **2**, 3, and 6. $(6 = 1 \times 6, 6 = 2 \times 3)$

The factors of 10 are **1**, **2**, 5, and 10. $(10 = 1 \times 10, 10 = 2 \times 5)$

The common factors of 6 and 10 are **1** and **2**. The largest common factor is **2**.

Divide both the numerator and the denominator by the largest common factor.

$$\frac{6}{10} = \frac{6 \div 2}{10 \div 2} = \frac{3}{5}$$

The simplest form of $\frac{6}{10}$ is $\frac{3}{5}$.

**4.** Turn to page 137 in your textbook. Do questions 3 and 4 of "Put into Practice."

Check your answers on pages 92 to 94 in the Appendix.

In this lesson you learned about equivalent fractions. To review the concepts of this lesson, work through "Lesson 7: Fractions and Equivalent Fractions" on the CD-ROM that accompanies your textbook.

The following website also reviews equivalent fractions:

**http://cne.gmu.edu/modules/dau/algebra/fractions/frac2_frm.html**

Turn to the Section 1 Assignment in Assignment Booklet 3A. Answer question 3.

# LESSON 4

## Adding and Subtracting Fractions

Today you will add and subtract fractions.

Sammy is concerned about the time it takes getting places. This morning it took her only 20 min to get to school. The traffic was light and there weren't a lot of people crossing at intersections. However, when she finished volleyball practice, it was rush hour. It took three quarters of an hour for Sammy to get home. The cars were bumper-to-bumper and the crosswalks were jammed. Are you able to figure out how long Sammy spent getting to and from school? After you finish this lesson, you will do it easily.

Turn to page 138 in your textbook. Study the contents of the coloured box at the top of the page. Can you name the fractions that the hexagon, rhombus, triangle, and trapezoid represent? Take out your pattern blocks. You will be using them in the following questions.

1. Continue on pages 138 and 139 in your textbook. Do questions 1 to 3 of "Investigation."

Check your answers on pages 94 and 95 in the Appendix.

Look closely at your answers for questions 1.b. and 2.b on page 138. Do you see an easy way to find the answer?

## Example

Calculate the following.

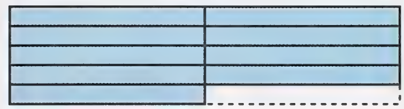
a. $\frac{9}{10} - \frac{6}{10}$

Model $\frac{9}{10}$.

Remove $\frac{6}{10}$.

$$\frac{9}{10} - \frac{6}{10} = \frac{9-6}{10}$$
$$= \frac{3}{10}$$

b. $\frac{9}{10} - \frac{3}{5}$



Model $\frac{9}{10}$.

Remove $\frac{3}{5}$.

$$\frac{9}{10} - \frac{3}{5} = \frac{9}{10} - \frac{3\times 2}{5\times 2}$$
$$= \frac{9}{10} - \frac{6}{10}$$
$$= \frac{9-6}{10}$$
$$= \frac{3}{10}$$

Make 10 the common denominator.

**2.** Turn to page 139 in your textbook. Do questions 1 to 4 of "Put into Practice."

Check your answers on pages 95 to 97 in the Appendix.

You have seen that is easy to add fractions with the same denominator. Now you will see how to handle fractions with different denominators. Turn to page 140 in your textbook. Study the instructions in the blue box.

Turn to page 141 in your textbook. Study Example 1. You will learn how to handle answers that are greater than 1.

Turn to page 142 in your textbook. Work through Examples 2 and 3. You will see how subtraction with different denominators is done. You will also see how to handle mixed numbers.

## Example

Do you remember Sammy from the introduction to Lesson 4? How long did she spend getting to and from school?

Sammy spent 20 min, or $\frac{1}{3}$ hour, getting to school.

She spent $\frac{3}{4}$ hour getting home.

The total time is $\frac{1}{3}$ hours $+ \frac{3}{4}$ hours.

$$
\begin{aligned}
\frac{1}{3}+\frac{3}{4} &= \frac{4\times 1}{4\times 3}+\frac{3\times 3}{3\times 4} \quad \text{12 makes a good common denominator. } (4\times 3=12)\\
&= \frac{4}{12}+\frac{9}{12}\\
&= \frac{13}{12}\\
&= \frac{12+1}{12}\\
&= \frac{12}{12}+\frac{1}{12}\\
&= 1\frac{1}{12} \text{ or 1 h and 5 min}
\end{aligned}
$$

The standard way to write time in hours is shown in this calculation. One hour is written as 1 h.

Sammy spent 1 h and 5 min getting to and from school.

3. Turn to page 143 in your textbook. Do questions 5 to 8 of "Put into Practice."

Check your answers on pages 98 to 102 in the Appendix.

You can use a calculator to solve fraction and mixed-number problems. The following instructions use keystrokes for the TI-30X IIS.

## Entering Fractions into Your Calculator

You use the [A b/c] key when entering fractions. [A b/c] is used to separate the numerator from the denominator. For example, you press the keys [2] [A b/c] [3] to enter $\frac{2}{3}$.

You also use the [A b/c] key when entering mixed numbers. [A b/c] is used to separate the whole number from the fraction and the numerator from the denominator. For example, you press the keys [2] [A b/c] [3] [A b/c] [8] to enter $2\frac{3}{8}$.

| Number as Written on Paper | Keystrokes | Display |
|---|---|---|
| $\frac{3}{7}$ | [3] [A b/c] [7] | 3⌟7 |
| $\frac{11}{16}$ | [1] [1] [A b/c] [1] [6] | 11⌟16 |
| $7\frac{5}{12}$ | [7] [A b/c] [5] [A b/c] [1] [2] | 7⌟5⌟12 |
| $11\frac{19}{32}$ | [1] [1] [A b/c] [1] [9] [A b/c] [3] [2] | 11⌟19⌟32 |
| $3\frac{7}{2}$ | [3] [A b/c] [7] [A b/c] [2] | 3⌟7⌟2 |

4. What keys do you press to enter the following values into your calculator? Copy and complete the table in your notebook.

| Number | Keystrokes | Number | Keystrokes |
|---|---|---|---|
| $\frac{1}{2}$ | | $\frac{12}{71}$ | |
| $\frac{5}{9}$ | | $8\frac{1}{5}$ | |
| $\frac{15}{16}$ | | $5\frac{2}{15}$ | |

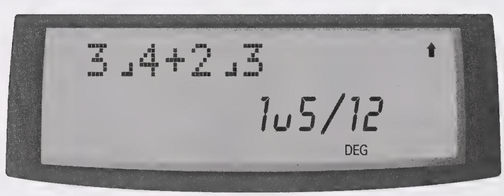
Check your answers on page 103 in the Appendix.

Once the fraction has been entered, you can perform calculations with it. The calculations are done exactly as they would be with whole numbers or decimals. Following are some examples of adding and subtracting fractions using a calculator.

## Example

What is $\frac{3}{4}+\frac{2}{3}$?

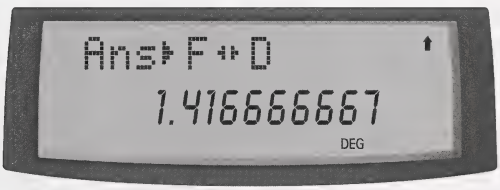
Use the following keystrokes.

The following keystrokes change the mixed fraction to an improper fraction.



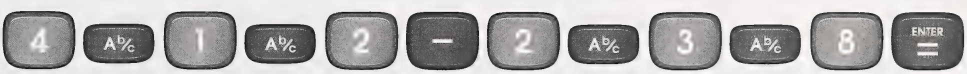
The following keystrokes change the improper fraction to a decimal fraction.

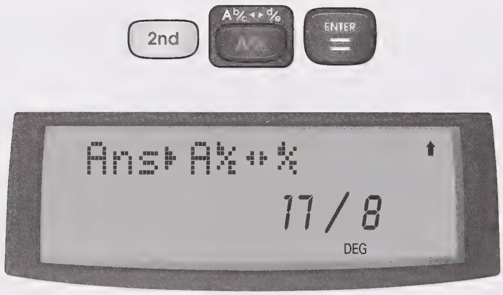

## Example

What is $4\frac{1}{2} - 2\frac{3}{8}$?

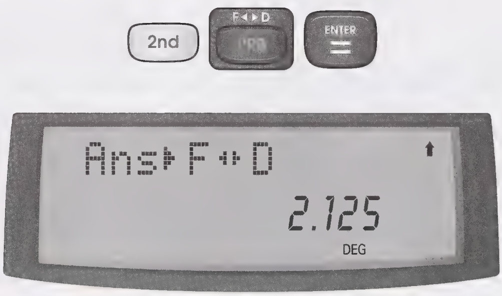
Use the following keystrokes.




The following keystrokes change the mixed fraction to an improper fraction.




The following keystrokes change the improper fraction to a decimal fraction.




5. **a.** What keystrokes would you use for the following calculations? Copy and complete the table in your notebook.

| Calculation | Keystrokes |
|---|---|
| $\frac{1}{2}+\frac{12}{24}$ | |
| $8\frac{1}{5}-7\frac{9}{10}$ | |
| $\frac{15}{16}+5\frac{2}{15}$ | |

**b.** Convert the answers to question 5.a. to improper fractions and decimal fractions. Copy and complete the table in your notebook.

| Calculation | Calculated Result | As an Improper Fraction | As a Decimal Fraction |
|---|---|---|---|
| $\frac{1}{2}+\frac{12}{24}$ | | | |
| $8\frac{1}{5}-7\frac{9}{10}$ | | | |
| $\frac{15}{16}+5\frac{2}{15}$ | | | |

Check your answers on pages 103 and 104 in the Appendix.

**6.** Turn to page 144 in your textbook. Answer questions 9 to 11 of “Put into Practice.” Complete your answers using pencil-and-paper methods. Check your answers using your calculator.

Check your answers on pages 104 and 105 in the Appendix.

In this lesson you learned about adding and subtracting fractions. To review the concepts of this lesson, work through “Lesson 8: Fractions—Add and Subtract” on the CD-ROM that accompanies your textbook.

The following website reviews adding and subtracting fractions:

**http://cne.gmu.edu/modules/dau/algebra/fractions/frac3_frm.html**

Turn to the Section 1 Assignment in Assignment Booklet 3A. Answer question 4.

# LESSON 5

## Multiplying Fractions

Today you will multiply fractions.

Welcome to dryland farming. Here, farmers often don't plant crops on all of their land each year. For each quarter section they own, they might plant only half of it. The idea is that the half not in crop is allowed to rest and accumulate moisture for next year's crop. The resting land is planted the next year. This year's cropland then gets a rest.

Ria plans to plant half of her land this year. If she owns 5 half sections, how many sections will she plant?

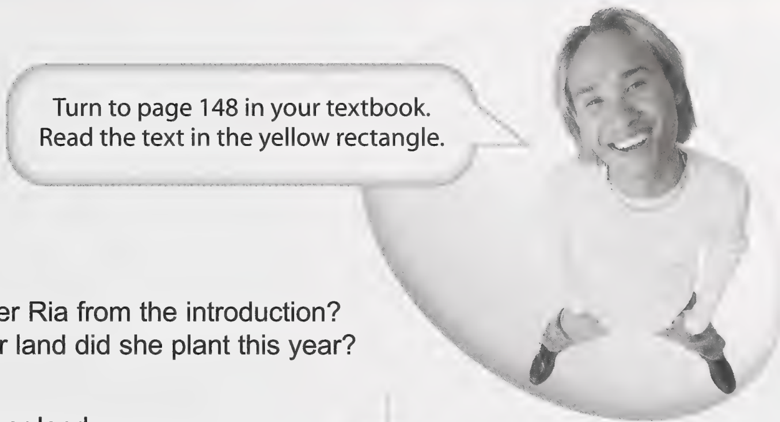
Are you ready to solve this kind of problem?

1. Turn to page 145 in your textbook. Do question 1 of "Investigation" carefully. Notice how the sample bulletin board is divided up.

Look closely at the numerator and the denominator. Do you see how they relate to the fractions in the question?

2. Turn to pages 146 and 147 in your textbook. Do questions 2 to 5 of "Investigation."

Check your answers on pages 105 to 108 in the Appendix.



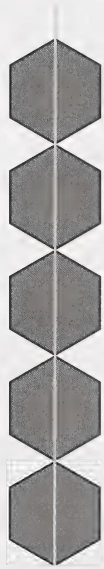

## Example

Do you remember Ria from the introduction?
How much of her land did she plant this year?

Ria plants $\frac{1}{2}$ of her land.

She owns $\frac{5}{2}$ sections.

The amount planted is $\frac{1}{2} \times \frac{5}{2}$.



$$\begin{aligned}\frac{1}{2} \times \frac{5}{2} &= \frac{1 \times 5}{2 \times 2} \\ &= \frac{5}{4} \\ &= \frac{4+1}{4} \\ &= \frac{4}{4} + \frac{1}{4} \\ &= 1\frac{1}{4}\end{aligned}$$

Ria will plant one and one quarter sections of land this year.

In the following questions you will practise multiplying fractions.

3. Turn to pages 148 and 149 in your textbook. Do questions 1 to 4 of "Put into Practice." The proper way to work out these problems is shown in questions 1 and 2.

Check your answers on pages 109 to 111 in the Appendix.

Read the statement in the yellow box on page 149. It tells you how to handle mixed numbers. Continue on page 149 in your textbook. Work through Example 1. It shows you how to solve a mixed-number multiplication.

4. Turn to page 150 in your textbook. Do questions 5 to 8 of "Put into Practice." Check your answers using your calculator. You will notice that your calculator gives you the simplest form of the answer.

Check your answers on pages 111 to 113 in the Appendix.

In this lesson you learned about multiplying fractions.

The following website reviews how to multiply fractions:

**http://cne.gmu.edu/modules/dau/algebra/fractions/frac4_frm.html**

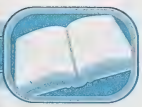
Turn to the Section 1 Assignment in Assignment Booklet 3A. Answer question 5.

# LESSON 6

## Dividing Fractions

Today you will divide fractions.

Ralph car pools with Quan and Daffney. It takes him a quarter tank of gas to get to work and back. Ralph checked his gas gauge on Wednesday before leaving for work. It read a little above three quarters full. Will he have to fill up before he gets home on Friday? This is the kind of problem that can be solved by dividing fractions.



Turn to page 151 in your textbook. Read the information in the yellow boxes. They remind you about the meaning of fractions and mixed numbers. Then study the information in the large orange box at the top of the page. You will see several examples of dividing fractions.

1. Turn to pages 151 and 152 in your textbook. Do questions 1 to 4 of "Put into Practice." The diagrams on page 151 will be very helpful. The hints on page 152 are also quite useful.

Check your answers on page 114 in the Appendix.

## Looking Back

You should be familiar with the terms used to describe division from earlier mathematics courses. The following example shows how **dividend**, **divisor**, and **quotient** are related.

| dividend | ÷ | divisor | = | quotient |
|---|---|---|---|---|
| 12 | ÷ | 4 | = | 3 |
| 20 | ÷ | 10 | = | 2 |

Turn to pages 153 and 154 in your textbook. Study the example in the blue box at the top of page 153. Notice how the three questions are really the same question. This is a pattern that you will see more of.

2. Continue on pages 153 and 154 in your textbook. Do questions 1 and 2 of "Investigation." Use your pattern blocks.

Check your answers on page 115 in the Appendix.

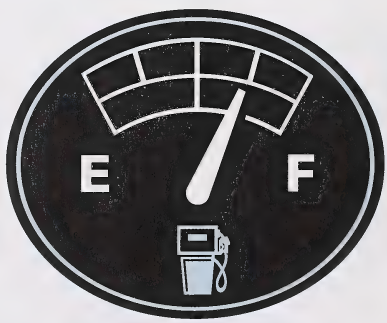
### Example

Do you remember the commuter, Ralph, from the introduction? He didn't fill up the vehicle on Wednesday, Thursday, or Friday morning. Will he get home Friday night?

Ralph had $\frac{3}{4}$ tank of gas.

He used $\frac{1}{4}$ tank of gas each trip.

Ralph can make $\frac{3}{4} \div \frac{1}{4}$ trips to and from work.




$$\begin{aligned}\frac{3}{4} \div \frac{1}{4} &= \frac{3}{\cancel{4}_{1}} \times \frac{\cancel{4}^{1}}{1}\\ &= \frac{3 \times 1}{1 \times 1}\\ &= \frac{3}{1} \text{ or } 3\end{aligned}$$

Ralph can make three complete trips. He will get home on Friday.

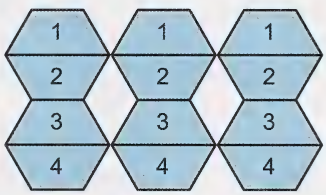
Now you should practise doing some divisions by yourself.

3. Turn to page 154 in your textbook. Do questions 5 to 7 of "Put into Practice." Model each question using your pattern blocks. Include a sketch with your answers.

Check your answers on pages 116 and 117 in the Appendix.

Now you are familiar with dividing by unit fractions (with a numerator of 1). The next step is dividing by other fractions. Turn to page 155 in the textbook. Study the information in the blue box at the top of the page.

The three double hexagons represent the number 3. In total, it takes twelve trapezoids to cover all 3 double hexagons. Three quarters $\left(\frac{3}{4}\right)$ is represented by 3 trapezoids.




Each numbered row of trapezoids is $\frac{3}{4}$. The diagram shows that there are four $\frac{3}{4}$'s in 3. In other words, $3 \div \frac{3}{4} = 4$.

4. Turn to page 155 in your textbook. Do questions 8 to 10 of "Put into Practice." Using your pattern blocks may be a big help.

Check your answers on pages 117 to 119 in the Appendix.

Turn to page 156 in your textbook. Study "Investigation" at the top of the page. (**Note:** The first row under Corresponding Multiplication should read $1\times\frac{6}{1}=\frac{6}{1}=6$. The textbook entry is incorrect.)

**5.** Did your method of dividing by a fraction involve multiplying? In the "old days," they used to say you divide by inverting and multiplying.

Check your answers on page 119 in the Appendix.

Study Examples 1 and 2 on pages 156 and 157 to see this method used. Example 2 brings in the added complication of mixed numbers.

**6.** Turn to page 157 in your textbook. Do questions 11 to 13 of "Put into Practice."

Check your answers on pages 119 to 121 in the Appendix.

In the last two lessons you learned about multiplying and dividing fractions. To review the concepts in these lessons, work through "Lesson 9: Fractions—Multiply and Divide" on the CD-ROM that accompanies your textbook.

The following website has a review of multiplying and dividing fractions:

**http://cne.gmu.edu/modules/dau/algebra/fractions/frac4_frm.html**

Turn to the Section 1 Assignment in Assignment Booklet 3A. Answer question 6.

# CONCLUSION

You have learned about fractions. You have added, subtracted, multiplied, and divided fractions. You know how to change mixed numbers to improper fractions and how to change improper fractions to mixed numbers. You can tell proper fractions from improper fractions. You have also learned how to tell if two fractions are equivalent and how to find several fractions that are equivalent to a given fraction.

Do you think a tree farmer would think about fractions when trees are being harvested? Would you be thinking of fractions if you were cutting logs into smaller pieces and then splitting them to make firewood? How about if you were cutting a pie or piecing together hundreds of bricks to make a fireplace? Now that you've had lots of practice working with fractions, you won't be surprised where they turn up.

Turn to the Section 1 Assignment in Assignment Booklet 3A. Answer questions 7 to 16.

When you are finished, submit Assignment Booklet 3A to your teacher to be marked.

# SECTION 2

## Ratios, Rates, and Percents

Earth is a magnificent place. Think about its beautiful plants and flowers. Think about the mountains, deserts, forests, and the beautiful seaside beaches. Think about the power of ocean storms. You don't see all these things at once. This picture of the Earth, taken by the Apollo 17 astronauts, shows much of Earth's majesty, but much is also missing. You can see large storms in the southern oceans, but could you see a rainstorm in Alberta? How about an orchid in Hawaii? To get the big picture, you often need to make comparisons.

In this section you will explore a variety of mathematical tools that will help you make comparisons. These mathematical tools are ratios, rates, percentages, and proportions.

# LESSON 1

## Ratio

Today you will discover what a ratio is.

A packed parking lot is a common scene around most shopping centres. Different kinds of vehicles can make designing a parking lot quite tricky. Do you try to accommodate the large crew-cab half-tons or just the smaller vehicles? One way to design a practical parking lot would be to analyze and compare the types and numbers of vehicles in the community the parking lot is to serve. This information would help you select the proper design. Ratios are one mathematical tool to help you make such comparisons.

Turn to page 239 in your textbook. Read the introduction to **ratio** at the top of the page. Continue by studying Example 1. Here, the numbers for the ratios came from the picture. The coloured ovals were counted and the results were used in the ratios.

Turn to page 240 in your textbook. Work through "Investigation."


Did you get the fractions $\frac{2}{3}$, $\frac{4}{6}$, $\frac{6}{9}$, and $\frac{8}{12}$? It's easy to see that these are equivalent fractions. $\frac{2\times2}{3\times2}=\frac{4}{6}$, $\frac{2\times3}{3\times3}=\frac{6}{9}$, and $\frac{2\times4}{3\times4}=\frac{8}{12}$ show that the needed multipliers are 2, 3, and 4.

The diagrams on page 240 show sets of blocks. The first diagram shows 1 set of 2 brown and 3 white blocks. The second diagram shows 2 sets of blocks. The third diagram shows 3 sets of blocks, and the last diagram shows 4 sets of blocks. These numbers of sets of blocks are the same as the multipliers used in this "Investigation."

Turn to page 241 in your textbook. Study Example 2 very closely.

## Looking Back

Ratios are reduced the same way fractions are. Find the greatest common factor of the terms. Divide each term by this greatest common factor.

### Example

Joe's recipe for biscuits calls for 8 tsp of baking powder and 2 tsp of salt. Of course, there is also flour, milk, and shortening that need to be added. What is the reduced ratio of baking powder to salt?

The ratio of baking powder to salt is $8:2$.
The factors of 2 are **1** and **2**. $(2=1\times2)$
The factors of 8 are **1**, **2**, 4, and 8. $(8=1\times8,\ 8=2\times4)$
The greatest common factor of 2 and 8 is **2**.
Reducing the ratio is done by dividing each term by 2.

$$\begin{aligned}8:2&=(8\div2):(2\div2)\\&=4:1\end{aligned}$$

Teaspoon is abbreviated tsp.

The ratio of baking powder to salt in Joe's recipe is $4:1$.

1. Turn to page 241 in your textbook. Do questions 1 and 2 of "Put into Practice."

Check your answers on pages 121 and 122 in the Appendix.

Remember that the solutions in the Appendix are good examples. Even if you find the questions easy, look at the solutions. They show you a complete and correctly solved question. They provide a model for how you should solve problems.

Turn to pages 242 and 243 in your textbook. Work through Examples 3 and 4 carefully. Notice how the ratios were reduced in Example 3. Example 4 shows how to use a ratio to solve problems. In these problems, the total number of parts is very useful.

Reducing a ratio generally requires finding the greatest common factor of the terms of the ratio. However, your calculator will reduce two-term ratios for you. Enter the ratio as a fraction and press the [ENTER =] key. The result is the reduced ratio. (You might have to change from a mixed number to an improper fraction.)

## Example

What are the simplest forms of the ratios 4 : 10, 9 : 15, and 112 : 72? Use your calculator to reduce these ratios to simplest form.

| Ratio | Keystrokes | Display |
|---|---|---|
| 4 : 10 | [4] [A b/c] [1] [0] [ENTER =] | 2 / 5 |
| 9 : 15 | [9] [A b/c] [1] [5] [ENTER =] | 3 / 5 |
| 112 : 72 | [1] [1] [2] [A b/c] [7] [2] [ENTER =] | 1u5 / 9 |
| | Change to an improper fraction. | |
| | [2nd] [A b/c ◂▸ d/e] [ENTER =] | 14 / 9 |

2. Turn to pages 242 and 243 in your textbook. Do questions 4 and 5 of “Put into Practice.”

Check your answers on page 122 in the Appendix.

Turn to page 244 in your textbook. Read through the question part of “Investigation” carefully.

3. There is a problem with “Investigation” as it appears in the textbook. What do you think the problem is?

Check your answer on page 123 in the Appendix.

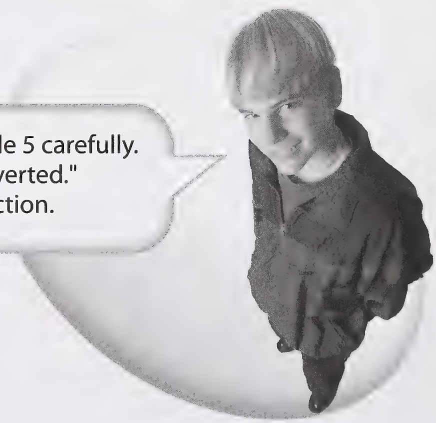
4. A recipe for a soft drink requires 80 parts of water, 8 parts of colouring, and 37 parts of sugar by mass.

   a. Write this in ratio form.

   b. How many grams of each ingredient are in a 750-g bottle of soft drink? (Use the answers laid out in “Investigation” on page 244 in your textbook, but substitute g for mL.)

Check your answers on page 123 in the Appendix.

Turn to page 245 in your textbook. Study Example 5 carefully. It shows that fraction equations can be "inverted." This will be very useful later on in this section.



## Example

Find the value of $m$ that makes the equation $\frac{6}{m}=\frac{27}{18}$ true.

Invert $\frac{6}{m}=\frac{27}{18}$ to get $\frac{m}{6}=\frac{18}{27}$. This "inversion" will make solving for $m$ simpler. You should try to get the variable into the numerator of a fraction.

$$\frac{m}{6}=\frac{18}{27}$$

Multiply by 6. Use these calculator keystrokes.

$$\overset{1}{\cancel{6}}\times\frac{m}{\underset{1}{\cancel{6}}}=\overset{2}{\cancel{6}}\times\frac{\overset{2}{\cancel{18}}}{\underset{\underset{1}{\cancel{3}}}{\cancel{27}}}$$


$$m=2\times2$$

$$m=4$$

The value $m=4$ makes both equations, $\frac{6}{m}=\frac{27}{18}$ and $\frac{m}{6}=\frac{18}{27}$, true.

**5.** Turn to pages 246 and 247 in your textbook. Do questions a. and b. of "Investigation."

Check your answers on page 124 in the Appendix.

Now that you've seen several ratio problems solved, you're ready to solve a couple for yourself.

**6.** Turn to page 247 in your textbook. Do questions 6 and 7 of "Put into Practice."

Check your answers on page 125 in the Appendix.

In this lesson you learned about ratio. The following website discusses ratio:

**http://www.new-london.k12.ia.us/grant/tutorial.htm**

Turn to the Section 2 Assignment in Assignment Booklet 3B. Answer question 1.

# LESSON 2

## Problem Solving with Ratios

Today you will use ratios to solve problems.

Bicycles are among the most efficient machines around. With multiple gears and multiple speeds, they can keep their engine (you) working at peak efficiency. Each time you shift gears, the gears used to propel the bike change. It becomes either easier or more difficult to push the pedals. This can be calculated by comparing the number of teeth on the chain-wheel gear with the number of teeth on the rear-wheel gear. This ratio determines the effort required to turn the pedal one rotation.

You can find out much more about bicycles and gears at the following website:

**http://www.howstuffworks.com/bicycle4.htm**

Turn to page 248 in your textbook. Work through Example 1 thoroughly. This example shows a three-term ratio. Each part of the solution uses just two terms of the ratio.

## Example

What is the simplest form of the ratio $15:30:75$?

The greatest common factor of 15, 30, and 75 is needed to reduce the ratio to its simplest form. The factors of 15 are 1, 3, 5, and 15. Only these factors need to be considered. They include all the possible common factors. Any common factor must be a factor of 15.

1, 3, 5, and 15 are also factors of 30. $(1\times30, 3\times10, 5\times6, 15\times2)$

1, 3, 5, and 15 are also factors of 75. $(1\times75, 3\times25, 5\times15)$

The greatest common factor is 15.

$$\begin{aligned}15:30:75 &= (15\div15):(30\div15):(75\div15)\\ &= 1:2:5\end{aligned}$$

Divide by the greatest common factor.

The simplest form of $15:30:75$ is $1:2:5$.

**1.** Turn to page 249 in your textbook. Do the question in "Investigation."

Check your answers on page 126 in the Appendix.

## Example

Which is the larger ratio, $7:13$ or $5:8$?

There are several ways to solve this question. One way is to change the ratios to decimal fractions.

$7:13 \doteq 0.538\,461\,538 \qquad 5:8 = 0.625$

The larger decimal value indicates the larger ratio.

Another way is to change the ratios to fractions with a common denominator.

$$7:13 \text{ is } \frac{7\times 8}{13\times 8}=\frac{56}{104} \qquad 5:8 \text{ is } \frac{5\times 13}{8\times 13}=\frac{65}{104}$$

The larger numerator indicates the larger ratio.

Another way is to cross-multiply. You just find the numerators of the fractions with a common denominator.

$$\frac{7}{13} \quad \frac{5}{8}$$

$$7\times 8 \qquad 5\times 13$$

$$56 \qquad 65$$

This is call cross-multiplying because the lines joining the terms to multiply make an X-shape.

The larger product shows the larger ratio.

The larger product is 65, so $\frac{5}{8}$ or $5:8$ is the larger ratio.

Each method shows that $5:8$ is larger than $7:13$.

2. Turn to pages 250 and 251 in your textbook. Do questions 1 to 6 of "Put into Practice."

Check your answers on pages 126 to 129 in the Appendix.

Turn to page 252 in your textbook. Work through Example 2. Did you notice how the total number of parts was used in solving the problem? Often you will need the total number of parts to solve questions.

3. Turn to pages 253 and 254 in your textbook. Do questions 7 to 11 of "Put into Practice." Notice the hints in the margin for question 7.

Check your answers on pages 129 to 133 in the Appendix.

In Lesson 2 you learned about solving problems using ratios. The following website has a review of ratios and proportions. You will be studying proportions in Lesson 6.

**http://cne.gmu.edu/modules/dau/algebra/fractions/frac5_frm.html**

Turn to the Section 2 Assignment in Assignment Booklet 3B. Answer question 2.

# LESSON 3

## Rate

Today you will investigate rates.

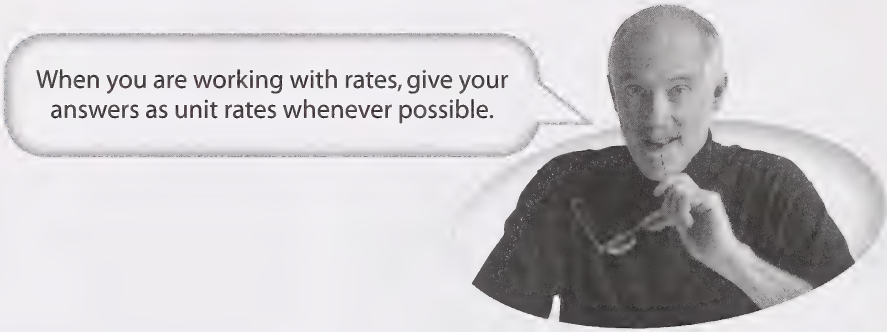
How much water is running downstream? This is a very tricky question to answer. Does the question ask for the amount in the last year, or just in the last couple of days, or maybe just in the last second? The best answer is to indicate the volume of water moving in a specified period of time. This is an example of a rate. You will be working with rates in this lesson. Rates are comparisons of two quantities involving different units, such as volume and time.

Turn to page 255 in your textbook. Read the definitions of **rate** and **unit rate** given in the yellow box on the left side of the page. Then, study the examples of rates given in the purple box at the top of the page. For each example, decide what the different units might be.

1. Continue on page 255 of your textbook. Do questions a. to e. of "Investigation." This will give you a chance to think about rates.

Check your answers on pages 133 and 134 in the Appendix.

Turn to page 256 in your textbook. Study Example 1. The two important parts of the problem are the total number of words and the total number of minutes. Notice how this information is used to find a unit rate.




Continue on page 256 in your textbook. Study Example 2. This example uses a rate given in days. Notice how this rate is used to find rates for weeks and years. You often have to know conversion factors like 365 days in a year or 7 days in a week.

Turn to page 257 in your textbook. Work through Example 3 carefully. It features simplifying a rate and solving a fraction equation. Notice that the result of part a. is used in part b.

## Example

Solve the equation $\frac{a}{10} = \frac{11}{20}$.

The variable is in the numerator of the fraction on the left side. Multiply by the denominator of this fraction. This will leave the variable all by itself.

**Paper-and-Pencil Method**

$$\frac{a}{10}=\frac{11}{20}$$

$$\overset{1}{\cancel{10}}\times\frac{a}{\underset{1}{\cancel{10}}}=\overset{1}{\cancel{10}}\times\frac{11}{\underset{2}{\cancel{20}}}$$

$$a=\frac{11}{2}$$

$$a=5\frac{1}{2}$$

**Calculator Method**

Press the following calculator keys.

1 1 $A^b/_c$ 2 0

× 1 0 ENTER =

## Example

Solve the equation $\frac{14}{w}=\frac{21}{75}$.

The variable is in the denominator. For the paper-and-pencil solution, rewrite the equation with the variable in the numerator to make the equation simpler to solve. Just "invert" the equation. With the calculator, the $x^{-1}$ key handles the inversion.

**Paper-and-Pencil Method**

$$\frac{14}{w}=\frac{21}{75}$$

$$\frac{w}{14}=\frac{75}{21}$$

$$\overset{1}{\cancel{14}}\times\frac{w}{\underset{1}{\cancel{14}}}=\overset{2}{\cancel{14}}\times\frac{\overset{25}{\cancel{75}}}{\underset{\underset{1}{\cancel{3}}}{\cancel{21}}}$$

$$w=2\times25$$

$$w=50$$

**Calculator Method**

Press the following calculator keys.

2 1 $A^b/_c$ 7 5

$x^{-1}$ × 1 4 ENTER =

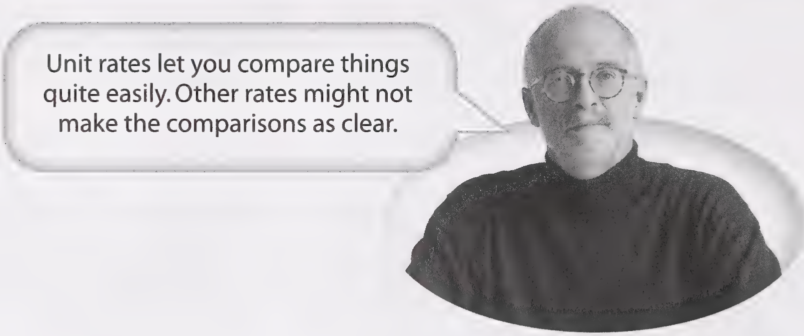
Once the equation is "inverted," the variable is in the numerator. This is easier to solve when using paper and pencil.

2. Turn to pages 258 and 259 in your textbook.

   a. Answer questions 1.a. to e., 2.a. and b., 3, 4, 5, and 6.a. to d. of "Put into Practice."

   b. If you feel you need more practice, answer questions 1.f. to h., 2.c. and d., and 6.e. to g. of "Put into Practice."

Check your answers on pages 134 to 140 in the Appendix.




Turn to page 260 in your textbook. Work through Example 4 carefully. This shows how unit rates make comparisons simpler. By using a unit rate, it is as if the second term of the ratio disappears. You only need to look at the first terms to do the comparison.

3. a. Turn to page 260 in your textbook. Answer questions 7 and 8 of "Put into Practice." Here you will use unit rates in a problem setting.

   b. Turn to pages 379 to 382 in your textbook. Answer questions 1, 8, and 9 of "Put into Practice."

Check your answers on pages 140 to 142 in the Appendix.

In the last three lessons you learned about ratios and rates. To review the concepts in these lessons, work through "Lesson 14: Rates and Ratios" on the CD-ROM that accompanies your textbook.

Turn to the Section 2 Assignment in Assignment Booklet 3B. Answer question 3.

# LESSON 4

## Percent

Today you will explore percent.

Many people think the penny should be abolished. It just doesn't have enough value to be bothered with. The one-cent piece has a long history. The name *cent* has an even longer history. It was used by the Romans more than 2000 years ago.

You can find out more about the history of Canadian coins at the following website:

**http://www.islandnet.com/~kpolsson/cancoin/**

You can see some arguments for abolishing the penny at this website:

**http://www.whyfor.com/nocents/nocents.htm**

Turn to page 261 in your textbook. Study the meaning of **percent** as described in the orange box.

1. Turn to page 261 in your textbook. Answer questions a. to e. of "Investigation." You will get a chance to see several uses of percent in everyday life.

Check your answers on page 143 in the Appendix.

Turn to pages 262 and 263 in your textbook. Study Examples 1 and 2 closely. They show how to solve several problems involving percent. In this example, the tricky part is setting up the equations.

## Example

Convert 35% to a fraction in simplest form.

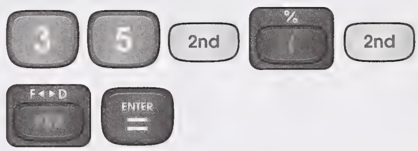
Percents are ratios with a second term of 100. It is easy to write any percent as a fraction. Just use the given number as the numerator and 100 as the denominator.

**Paper-and-Pencil Method**

$$\begin{aligned} 35\% &= \frac{35}{100} \\ &= \frac{35 \div 5}{100 \div 5} \\ &= \frac{7}{20} \end{aligned}$$

**Calculator Method**

Press the following calculator keys.




35% as a fraction in simplest form is $\frac{7}{20}$.

## Example

Convert the ratio $19:25$ to a percent.

Write the ratio in fraction form. Convert the fraction to an equivalent fraction with a denominator of 100. You can always do this. Find 0.01 times the current denominator $(0.01 \times 25 = 0.25)$. Divide both the numerator and denominator by this value.

**Paper-and-Pencil Method**

$$\frac{19}{25} = \frac{19 \div 0.25}{25 \div 0.25}$$
$$= \frac{76}{100}$$
$$= 76\%$$

**Calculator Method**

Press the following calculator keys.

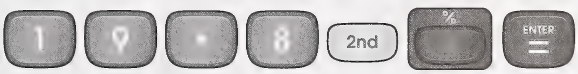

2. Turn to pages 262 and 263 in your textbook. Answer questions 1 and 2 of “Put into Practice.”

Check your answers on pages 143 and 144 in the Appendix.

Turn to pages 264 to 267 in your textbook. Study Examples 3 and 4 closely. They show how to change percents to fractions and vice versa even when the percents are not whole numbers. Then study Example 5 carefully. It shows how to change percents to a decimal fraction. If you are using your calculator, you do not need to simplify the fraction before doing the division.

## Example

Use your calculator to find the decimal equivalent of 19.8%




3. Turn to pages 266 and 267 in your textbook.

   a. Use paper-and-pencil methods to answer questions 3.a., b., f., and g.; 4.a., b., f., and i.; 5.; and 6.a. to c. of “Put into Practice.”

   b. Use calculator methods to answer questions 3.c., d., e., and h.; 4.c., d., g., and h.; and 6.d. to f. of “Put into Practice.”

   c. If you want more practice, answer questions 3.i. to l.; 4.e., j., k., and l.; and 6.g. to j. of “Put into Practice.”

Check your answers on pages 144 to 149 in the Appendix.

Turn to pages 268 and 269 in your textbook. Study Example 6 thoroughly. It shows how to set up a proportion to calculate a tip.

## Example

Calculate 240% of $85.

240% can be represented as the fraction $\frac{240}{100}$ or as the decimal fraction 2.4.

240% of $85 tells you to multiply the two numbers (once the percent is changed to a fraction).

**Paper-and-Pencil Method**

$$\frac{240}{100}\times\$85=\frac{\overset{12}{\cancel{240}}\times\overset{17}{\cancel{\$85}}}{\underset{\underset{1}{\cancel{5}}}{\cancel{100}}}$$

$$=12\times\$17$$

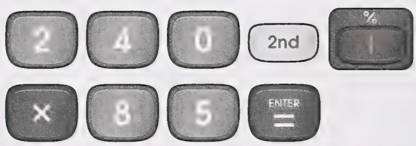
$$=\$204$$

or

$$2.4\times\$85=\$204$$

**Calculator Method**

Press the following calculator keys.




240% of $85 is $204.

4. Turn to page 270 in your textbook. Answer questions 7 to 9 of "Put into Practice."

Check your answers on pages 150 and 151 in the Appendix.

In this lesson you learned about percents. The following website has a review of percents:

**http://cne.gmu.edu/modules/dau/algebra/fractions/frac6_frm.html**

Turn to the Section 2 Assignment in Assignment Booklet 3B. Answer question 4.

# LESSON 5

## Problems Using Percent

Today you will solve problems using percent.

One popcorn company says that 2 tbsp of popcorn kernels will make 64 tbsp of popcorn to eat. This is a huge increase in volume! You can express this increase using percent. Do you know the percentage increase in volume that popping the kernels causes? You will be able to find this percent by the time you finish this lesson!

Turn to pages 271 to 273 in your textbook. Work through Examples 1, 2, and 3 thoroughly. They show a variety of percent problems being solved. You will be able to use similar techniques with other problems.

1. Turn to page 273 in your textbook. Answer questions 1 to 3 of “Put into Practice.”

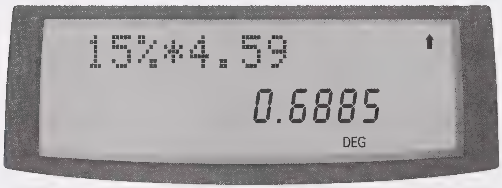
Check your answers on pages 151 to 153 in the Appendix.

Turn to page 274 in your textbook. Work through Example 4 carefully. It shows you how to calculate the GST.

## Example

A meal in a fast-food restaurant in Nova Scotia cost \$4.59 before taxes. The harmonized sales tax (a blend of the provincial sales tax and the GST) is $15\%$. How much tax is added to the cost of this meal? How much in total had to be paid?

With your TI-30X IIS calculator, you press the following keys to find $15\%$ of \$4.59.


The result is 0.6885, so the tax is \$0.69.

The total bill will be $\$4.59 + \$0.69 = \$5.28$.

2. Turn to pages 274 to 277 in your textbook.

   a. Answer questions 4 to 7 and questions 10 and 11 of “Put into Practice.”

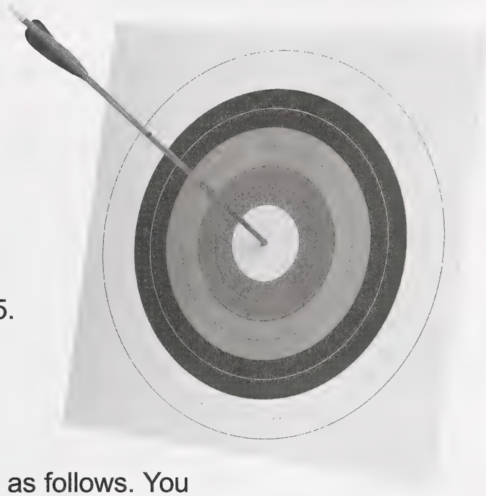
   b. If you would like more practice, answer questions 8 and 9 of “Put into Practice.”

Check your answers on pages 153 to 160 in the Appendix.

Turn to page 377 in your textbook. Work through Examples 1 and 2 carefully. You will have seen one way that percent is used in advertising.

### Example

An archery range offers a 25% discount on Tuesday afternoons. Their regular rate is \$15.00/h. What will their Tuesday afternoon rate be?



$$\begin{aligned} 25\% \text{ of } \$15.00 &= 0.25 \times \$15.00 \\ &= \$3.75 \end{aligned}$$

The Tuesday afternoon discount is \$3.75.

The Tuesday afternoon rate will be $\$15.00 - \$3.75 = \$11.25/\text{h}$.

Alternatively, you can solve this problem as follows. You will find the price to be paid, but you will not know the dollar value of the discount.

A $25\%$ discount leaves $100\% - 25\% = 75\%$ of the original price to be paid.

$$\begin{aligned} 75\% \text{ of } \$15.00 &= 0.75 \times \$15.00 \\ &= \$11.25 \end{aligned}$$

The Tuesday afternoon rate will be \$11.25/h.

**3.** Turn to page 378 in your textbook. Answer questions 1, 2, and 3 of "Put into Practice."

Check your answers on pages 160 to 164 in the Appendix.

In the last two lessons you learned about percent and solving problems using percent. To review the concepts in these lessons, work through "Lesson 15: Percent" on the CD-ROM that accompanies your textbook.

Turn to the Section 2 Assignment in Assignment Booklet 3B. Answer question 5.

# LESSON 6

## Proportions

Today you will study proportion.

Lee is a biologist. She wants to determine the population of arctic char in a northern lake. Lee's team nets 1000 char. They tag them and then release them back into the lake. A month later, when the tagged char have mixed with the rest of the fish in the lake, Lee's team returns. They net 500 char. Of these 500 fish, 50 have tags. Lee can now use a statistical analysis based on the proportion of tagged fish in the 500 netted fish to estimate the total char population.

Turn to page 278 in your textbook. Think about the questions in "Start Thinking."

Turn to page 279 in your textbook. Study the definition and examples of **proportion** given in the coloured box at the top of the page. Then study the two ways of writing a proportion shown at the bottom of the page.

A proportion can be written using ":-based" ratios, like 5:3 = 10:6, or "fraction-based" ratios, like $\frac{5}{3} = \frac{10}{6}$.

Turn to page 280 in your textbook. Work through Example 1 carefully. Writing the proportion is the major step in this problem. In problems, the first step is looking for things that are proportional.

1. Turn to page 280 in your textbook. Answer the question in "Investigation." (What is the proportion in this situation?)

Check your answers on page 164 in the Appendix.

## Example

What value for $A$ will make the proportion $10 : A = 64 : 48$ true? Rewrite the proportion in fraction form, $\frac{10}{A} = \frac{64}{48}$. The unknown value is in the denominator. Use the "inverted" version of the proportion for your paper-and-pencil work.

**Paper-and-Pencil Method**

$$\frac{10}{A} = \frac{64}{48}$$

$$\frac{A}{10} = \frac{48}{64}$$

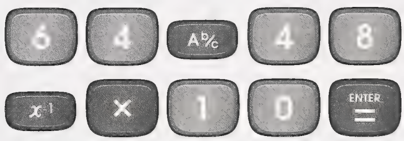
$$\overset{1}{\cancel{10}} \times \frac{A}{\underset{1}{\cancel{10}}} = \overset{5}{\cancel{10}} \times \frac{\overset{3}{\cancel{48}}}{\underset{\underset{2}{\cancel{4}}}{\cancel{64}}}$$

$$A = \frac{5 \times 3}{2}$$

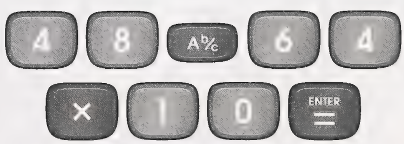
$$A = \frac{15}{2} \text{ or } 7\frac{1}{2}$$

**Calculator Method**

Press the following calculator keys.




or




When $A$ is $7\frac{1}{2}$ (7.5), the proportion $10 : A = 64 : 48$ will be true.

2. Turn to page 281 in your textbook. Answer questions 1 to 3 of "Put into Practice."

Check your answers on pages 164 and 165 in the Appendix.

Turn to page 282 in your textbook. Work through Example 3 carefully. (**Note:** There is no Example 2 in this tutorial.) Again, the major step is setting up the proportion.

3. Turn to pages 282 and 283 in your textbook. Answer questions 4 to 9 of "Put into Practice."

Check your answers on page 166 and 167 in the Appendix.

In this lesson you learned about proportions and solving problems using proportions. The following website has a review of ratios and proportions:

**http://cne.gmu.edu/modules/dau/algebra/fractions/frac5_frm.html**

The following website also deals with ratio and proportion:

**http://www.indiana.edu/~atmat/units/ratio/ratio_r6.htm**

Turn to the Section 2 Assignment in Assignment Booklet 3B. Answer question 6.

# CONCLUSION

In this section you have learned what ratios, rates, and percents are. You have used them to solve problems. You have also learned about proportions. You now know how to solve them and where to use them.

Think about the amount of rain pouring down in an Alberta thunderstorm. Now think about the amount of rain a Caribbean hurricane delivers. How would you compare these two amounts? Would you use rates like L/s or give a ratio? Now that you've studied rates, ratios, and percents, you have a lot of tools you could use.

The following website deals with ratios, rates, percents, and proportions:

**http://www.mathleague.com/help/ratio/ratio.htm**

Turn to the Section 2 Assignment in Assignment Booklet 3B. Answer questions 7 to 15.

# MODULE SUMMARY

In this module you explored fractions, rates, ratios, percents, and proportions. You learned how to add, subtract, multiply, and divide fractions. These skills were developed using pattern blocks, diagrams, and your calculator. You also learned how to compare different quantities using ratios and rates. You used the equation-solving skills from Module 2, along with your new skills, to solve a variety of everyday problems.

Our relay team probably didn't realize how much mathematics could be found in their race. They thought of faster times (not fractions of seconds or rates of speed). They thought of their part of the race (not in percentages, like each of them was running 25% of the distance). Do you find it's easier to see the mathematics in things when you're not busy doing them?

Turn to Assignment Booklet 3B and complete the Final Module Assignment.

When you are done, submit Assignment Booklet 3B to your teacher to be marked.

# REVIEW

This Review will help you apply what you learned in Module 3 and prepare for the Final Test. Read over the skills checklist for this module. Use this list to guide your study and to help you decide how much of the Review you should complete.

## Skills Checklist

### Fractions

- ❑ Demonstrate an understanding of what fractions are.
- ❑ Demonstrate an understanding of mixed numbers and improper fractions.
- ❑ Demonstrate an understanding of equivalent fractions.
- ❑ Demonstrate an understanding of and proficiency with adding, subtracting, multiplying, and dividing fractions.
- ❑ Use fractions to solve everyday problems.

### Ratio

- ❑ Demonstrate an understanding of what a ratio is.
- ❑ Use ratios to solve everyday problems.

### Rate

- ❑ Demonstrate an understanding of what a rate is.
- ❑ Use rates to solve everyday problems.

### Percent

- ❑ Demonstrate an understanding of what a percent is.
- ❑ Use percent to solve everyday problems.

### Proportions

- ❑ Demonstrate an understanding of what a proportion is.
- ❑ Use proportions to solve everyday problems.

If you need additional work to master the material in this module, work through the following lessons on the CD-ROM that accompanies your textbook:

- "Lesson 7: Fractions and Equivalent Fractions"
- "Lesson 8: Fractions—Add and Subtract"
- "Lesson 9: Fractions—Multiply and Divide"
- "Lesson 14: Rates and Ratios"
- "Lesson 15: Percent"

1. Turn to page 201 in your textbook. Answer "Review" questions 1.a. to c. and 3.a. to c.

2. Turn to page 202 in your textbook.

   a. Answer "Review" questions 4.a. to d. and 5.a. to d.
   b. Answer "Review" questions 6.a. to d., 6.h to k., and 7.a. to d.

3. Turn to page 203 in your textbook.

   a. Answer "Review" questions 8.a., b., e., and f.
   b. Answer "Review" question 9.

4. Turn to pages 284 and 285 in your textbook. Answer questions 3, 4, and 6.

5. Turn to pages 286 and 287 in your textbook. Answer questions 8, 9, and 11.

6. Turn to pages 288 and 289 in your textbook. Answer questions 12, 14, and 16.

Check your answers on pages 168 to 176 in the Appendix.

# MATHEMATICS

# 14

# Appendix

GLOSSARY
ANSWER KEY
IMAGE CREDITS
LEARNING AIDS

# Glossary

**common fraction:** a number written in the form $\frac{\text{numerator}}{\text{denominator}}$

A fraction is usually used to represent a division of whole numbers that doesn't give a whole number answer.

**denominator:** the bottom number in a common fraction

For example, 5 is the denominator in each of the following fractions: $\frac{2}{5}$, $\frac{3}{5}$, $\frac{7}{5}$, and $\frac{187}{5}$.

**equivalent fractions:** fractions with the same value but different denominators

For example, $\frac{2}{3}$, $\frac{4}{6}$, $\frac{6}{9}$, and $\frac{10}{15}$ are equivalent fractions.

**fraction:** a number written in the form $\frac{\text{numerator}}{\text{denominator}}$

A fraction is usually used to represent a division of numbers that doesn't give a whole number answer.

**improper fraction:** a fraction larger than 1

The numerator of an improper fraction is larger than the denominator. For example, the following are improper fractions: $\frac{5}{4}$, $\frac{71}{8}$, $\frac{399}{273}$, and $\frac{14}{11}$.

**mixed number:** a number that is the sum of a whole number and a fraction, such as $3\frac{1}{4}$

**numerator:** the top number in a common fraction

For example, 5 is the numerator in each of the following fractions: $\frac{5}{2}$, $\frac{5}{3}$, $\frac{5}{7}$, and $\frac{5}{187}$.

**percent:** a ratio with a second term of 100

**proper fraction:** a fraction between 0 and 1

The numerator of a proper fraction is less than the denominator. For example, the following are proper fractions: $\frac{1}{4}$, $\frac{7}{8}$, $\frac{199}{273}$, and $\frac{5}{11}$.

**proportion:** an equation showing that two ratios are equal

**rate:** a comparison of two different quantities measured in different units

**ratio:** a comparison of quantities with the same units

**simplest form:** a fraction with no common factors of its numerator and denominator

For example, $\frac{2}{3}$, $\frac{1}{5}$, $\frac{5}{9}$, and $\frac{13}{15}$ are in simplest form.

**unit rate:** a comparison of two different quantities in which the second term has a value of 1

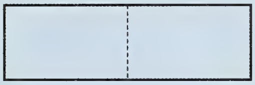
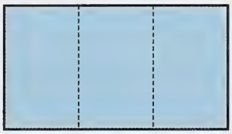
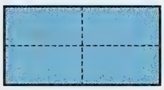
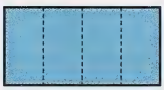
# Answer Key

## Section 1: Fractions

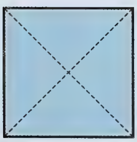
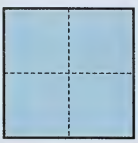
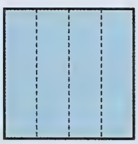
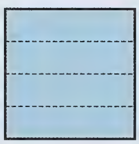
### Lesson 1: What Is a Fraction?

**1. Textbook, pages 122 and 123, "Investigation," questions 1 to 3**

**1.**

| Poster | Which Envelope? | Sketch of Poster Showing Fold Lines | Folded Poster Is What Fraction of Original Size? |
|---|---|---|---|
| A | 38 cm by 23 cm<br>$76 = 38 \times 2$<br>$23 = 23 \times 1$ |  | $\frac{1}{2}$ |
| B | 38 cm by 23 cm<br>$38 = 38 \times 1$<br>$69 = 23 \times 3$ |  | $\frac{1}{3}$ |
| C | 24 cm by 12 cm<br>$48 = 24 \times 2$<br>$24 = 12 \times 2$<br><br>$48 = 12 \times 4$<br>$24 = 24 \times 1$ | <br>or<br> | $\frac{1}{4}$ |

**2. a.** Here are four ways to fold a square into four equal parts.

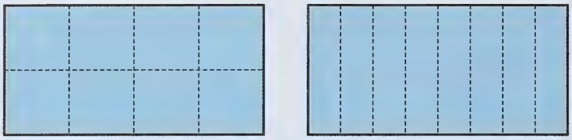
   

**b.** Did you find any other ways to fold your square of paper?

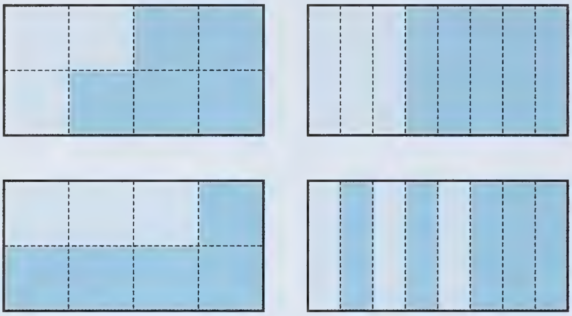
**c.** The folds are shown in the answer to question 2.a. Each dotted line is a fold in the paper.

**d.** There are 4 quarters in 1 whole.

3. **a.** Two ways of folding the page are shown here.



**b.** Here are some ways of shading the rectangle. Each shows 3 parts of 8 shaded.

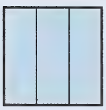


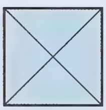
There are many more ways to shade the rectangles.

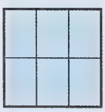
**c.** There are 8 eighths in 1 whole.

**2. Textbook, page 124, "Put into Practice," questions 1 to 3**

1. **a.**  There are 2 halves in 1 whole.

   **b.**  There are 3 thirds in 1 whole.

   **c.**  There are 4 quarters in 1 whole.

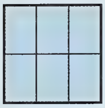
   **d.**  There are 6 sixths in 1 whole.

**e.** 

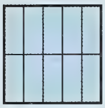
There are 10 tenths in 1 whole.

**f.** 

There are 5 fifths in 1 whole.

**2. a.** 

$\frac{?}{6} = 1$ tells you that 1 object is divided into 6 equal parts. If an object is divided into 6 equal parts, it takes all 6 of the parts to make up the whole. The question mark (?) must be 6.

**b.** 

$\frac{?}{10} = 1$ tells you that 1 object is divided into 10 equal parts. If an object is divided into 10 equal parts, it takes all 10 of the parts to make up the whole. The question mark (?) must be 10.

**c.** 

$\frac{?}{5} = 1$ tells you that 1 object is divided into 5 equal parts. If an object is divided into 5 equal parts, it takes all 5 of the parts to make up the whole. The question mark (?) must be 5.

**3. a.** Twenty-five cents is $\frac{25}{100} = \frac{1}{4}$ of a loonie. Generally, you should write fractions using the smallest numbers possible.

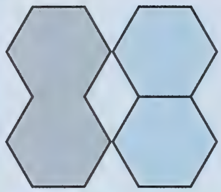
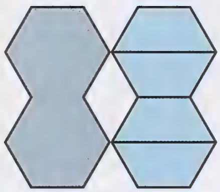
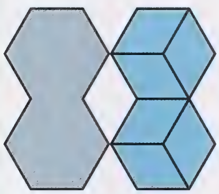
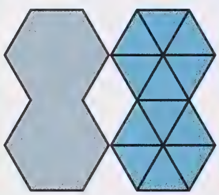
**b.** One day is $\frac{1}{7}$ of a week because there are 7 days in a week.

**c.** One period is $\frac{1}{3}$ of a hockey game because there are 3 periods in a game. (Unless there are overtime periods.)

**d.** One side is $\frac{1}{6}$ of the perimeter of a regular hexagon because a hexagon has 6 sides.

**e.** One dime is $\frac{1}{20}$ of a toonie because there are 20 dimes in a toonie.

3. **Textbook, page 125, "Investigation"**

| Shape Used to Cover Double Hexagon | Diagram | Number of Shapes Needed to Cover It | Fraction Represented By | |
|---|---|---|---|---|
| Hexagon |  | 2 | 1 hexagon<br>$\frac{1}{2}$ | 2 hexagons<br>$\frac{2}{2}=1$ |
| Trapezoid |  | 4 | 1 trapezoid<br>$\frac{1}{4}$ | 3 trapezoids<br>$\frac{3}{4}$ |
| Rhombus |  | 6 | 1 rhombus<br>$\frac{1}{6}$ | 5 rhombi<br>$\frac{5}{6}$ |
| Triangle |  | 12 | 1 triangle<br>$\frac{1}{12}$ | 7 triangles<br>$\frac{7}{12}$ |

4. **Textbook, page 126, "Put into Practice," questions 4 to 6**

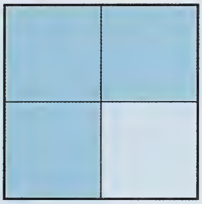
4. a. The double hexagon is completely covered by 12 triangles. Five triangles would represent $\frac{5}{12}$ of the double hexagon.

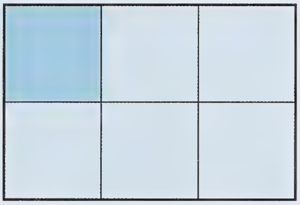
   b. The double hexagon is completely covered by 4 trapezoids. Three trapezoids would represent $\frac{3}{4}$ of the double hexagon.

c. The double hexagon is completely covered by 6 rhombi. Five rhombi would represent $\frac{5}{6}$ of the double hexagon.

d. The double hexagon is completely covered by 12 triangles. Nine triangles would represent $\frac{9}{12} = \frac{3}{4}$ of the double hexagon.

5. Answers will vary. Sample answers are given.

a. 

b. 

c. 

6. a. $\frac{1}{2} = \frac{2}{4}$, so $\frac{3}{4} > \frac{1}{2}$.

b. $\frac{2}{3} = \frac{4}{6}$, so $\frac{5}{6} > \frac{2}{3}$.

c. $\frac{1}{2} = \frac{6}{12}$, so $\frac{1}{2} > \frac{5}{12}$.

**5. Textbook, page 126, "Put into Practice," question 7**

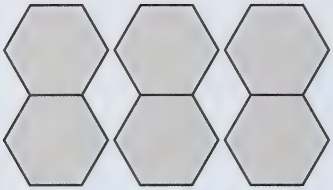
| 7. **Proper Fractions** | | **Improper Fractions** | |
|---|---|---|---|
| a. $\frac{1}{7}$ | $1 < 7$ | b. $\frac{5}{3}$ | $5 > 3$ |
| c. $\frac{7}{9}$ | $7 < 9$ | e. $\frac{8}{7}$ | $8 > 7$ |
| d. $\frac{2}{11}$ | $2 < 11$ | f. $\frac{19}{17}$ | $19 > 17$ |
| | | g. $\frac{9}{2}$ | $9 > 2$ |

## Lesson 2: Mixed Numbers and Improper Fractions

**1. Textbook, page 127, "Investigation," questions 1 to 3**

**1. a.** It takes six yellow hexagons to cover the three double hexagons.

**b.**

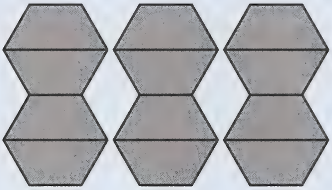


**c.** Three wholes are the same as **6** halves.

$$3 = \frac{6}{2}$$

**2. a.** It takes 12 red trapezoids to cover the three double hexagons.

**b.**

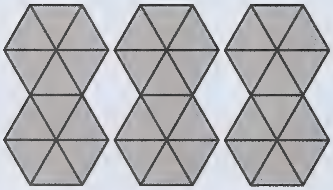


**c.** Three wholes are the same as **12** quarters.

$$3 = \frac{12}{4}$$

**3. a.** It takes 36 green triangles to cover the three double hexagons.

**b.**



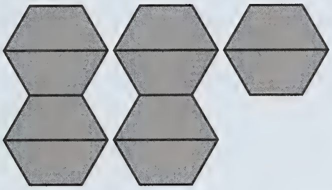
**c.** Three wholes are the same as **36** twelfths.

$$3 = \frac{36}{12}$$

2. **Textbook, page 128, "Put into Practice," questions 1 and 2**

**1. a.** It takes ten red trapezoids to cover $2\frac{1}{2}$. There are ten quarters in $2\frac{1}{2}$.

**b.**

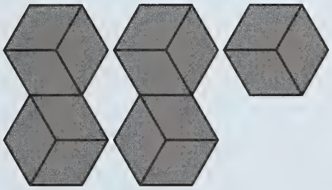


**c.** Two-and-a-half is the same as ten quarters.

$$2\frac{1}{2}=\frac{10}{4}$$

**2. a.** It takes 15 purple rhombi to cover $2\frac{1}{2}$. There are 15 sixths in $2\frac{1}{2}$.

**b.**

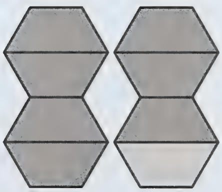


**c.** Two-and-a-half is the same as 15 sixths.

$$2\frac{1}{2}=\frac{15}{6}$$

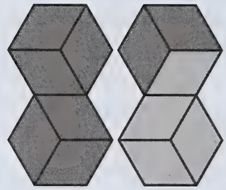
3. **Textbook, page 129, "Put into Practice," questions 3 and 4**

**3. a.** Seven red trapezoids cover one whole double hexagon with three trapezoids left over. One red trapezoid represents one quarter. Seven red trapezoids represent seven quarters.



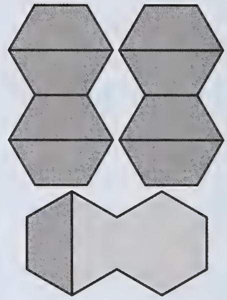
$$\frac{7}{4}=1+\frac{3}{4} \text{ or } 1\frac{3}{4}$$

b. Eight blue rhombi cover one whole double hexagon with two rhombi left over. One blue rhombus represents one sixth. Eight blue rhombi represent eight sixths.



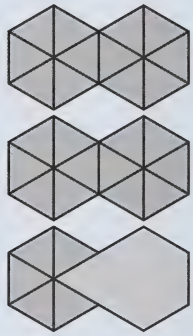
$$\frac{8}{6}=1\frac{2}{6} \text{ or } \frac{8}{6}=1\frac{1}{3}$$

**4.** a. Nine red trapezoids cover two whole double hexagons with one trapezoid left over.



$$\frac{9}{4}=2+\frac{1}{4} \text{ or } 2\frac{1}{4}$$

b. Twenty-nine green triangles cover two whole double hexagons with five triangles left.



$$\frac{29}{12}=2+\frac{5}{12} \text{ or } 2\frac{5}{12}$$

**4. Textbook, page 131, "Put into Practice," questions 6, 7, 8, and 10**

**6.** a.

| | |
|---|---|
| $2\frac{1}{4}=2+\frac{1}{4}$ | A mixed number is the sum of an integer and a fraction. |
| $=\frac{2\times 4}{4}+\frac{1}{4}$ | Each whole is made of four quarters. |
| $=\frac{8}{4}+\frac{1}{4}$ | Two wholes are $2\times 4=8$ quarters. |
| $=\frac{9}{4}$ | Eight quarters plus one quarter is nine quarters. |

**b.** $1\frac{1}{2} = 1 + \frac{1}{2}$ A mixed number is the sum of an integer and a fraction.

$= \frac{2}{2} + \frac{1}{2}$ Two halves make a whole.

$= \frac{3}{2}$ Two halves plus one half is three halves.

**c.** $3\frac{1}{5} = 3 + \frac{1}{5}$ A mixed number is the sum of an integer and a fraction.

$= \frac{3 \times 5}{5} + \frac{1}{5}$ Each whole is made of five fifths.

$= \frac{15}{5} + \frac{1}{5}$ Three wholes are $3 \times 5 = 15$ fifths.

$= \frac{16}{5}$ Fifteen fifths plus one fifth is 16 fifths.

**d.** $2\frac{1}{3} = 2 + \frac{1}{3}$ A mixed number is the sum of an integer and a fraction.

$= \frac{2 \times 3}{3} + \frac{1}{3}$ Each whole is made of three thirds.

$= \frac{6}{3} + \frac{1}{3}$ Two wholes are $2 \times 3 = 6$ thirds.

$= \frac{7}{3}$ Six thirds plus one third is seven thirds.

**e.** $2\frac{3}{8} = 2 + \frac{3}{8}$ A mixed number is the sum of an integer and a fraction.

$= \frac{2 \times 8}{8} + \frac{3}{8}$ Each whole is made of eight eighths.

$= \frac{16}{8} + \frac{3}{8}$ Two wholes are $2 \times 8 = 16$ eighths.

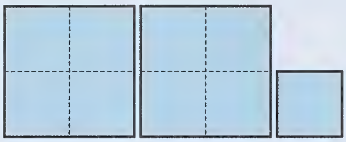
$= \frac{19}{8}$ Sixteen eighths plus three eighths is 19 eighths.

7. a. There are four quarters in each dollar. Two dollars is the same as eight quarters. Fifty cents is the same as two quarters. Eight quarters plus two quarters is ten quarters. There are ten quarters in \$2.50.

   b. There are four quarters in each game. Three games would have three times as many quarters as one game. Three times four is 12. There are 12 quarters in three football games.

   c. There are two halves in each game. Two games would have four halves in total. Four halves plus one half is five halves. The school team played five halves of shut-out soccer.

8. a.

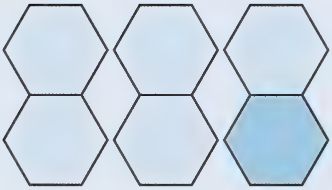


   b. You have two wholes and one additional quarter.

   c. $\frac{9}{4} = 2 + \frac{1}{4}$

   $= 2\frac{1}{4}$

10.



There are two wholes plus an additional one half.

$\frac{5}{2} = 2 + \frac{1}{2}$

$= 2\frac{1}{2}$

5. **Textbook, page 132, "Put into Practice," questions 11 and 12**

**11. a.** $\frac{7}{2}$ means $7 \div 2$.

$$\begin{array}{rl} 2\overline{)7}^{\,3} & \text{number of wholes} \\ -\ 6 & \text{number of halves used} \\ \hline 1 & \text{number of halves left} \end{array}$$

The resulting mixed number is three wholes plus one half, or $3\frac{1}{2}$.

**b.** $\frac{4}{3}$ means $4 \div 3$.

$$\begin{array}{rl} 3\overline{)4}^{\,1} & \text{number of wholes} \\ -\ 3 & \text{number of thirds used} \\ \hline 1 & \text{number of thirds left} \end{array}$$

The resulting mixed number result is one whole plus one third, or $1\frac{1}{3}$.

**c.** $\frac{8}{3}$ means $8 \div 3$.

$$\begin{array}{rl} 3\overline{)8}^{\,2} & \text{number of wholes} \\ -\ 6 & \text{number of thirds used} \\ \hline 2 & \text{number of thirds left} \end{array}$$

The resulting mixed number is two wholes plus two thirds, or $2\frac{2}{3}$.

**d.** $\frac{11}{4}$ means $11 \div 4$.

$$\begin{array}{rl} 4\overline{)11}^{\,2} & \text{number of wholes} \\ -\ 8 & \text{number of quarters used} \\ \hline 3 & \text{number of quarters left} \end{array}$$

The resulting mixed number is two wholes plus three quarters, or $2\frac{3}{4}$.

e. $\frac{23}{10}$ means $23 \div 10$.

$$\begin{array}{r l}
10\overline{)23}^{\;2} & \text{number of wholes} \\
-\ 20 & \text{number of tenths used} \\
\hline
3 & \text{number of tenths left}
\end{array}$$

The resulting mixed number is two wholes plus three tenths, or $2\frac{3}{10}$.

12. a. $1\frac{1}{2} = 1 + \frac{1}{2}$ A mixed number is the sum of the whole number and the fraction.

$= \frac{1 \times 2}{2} + \frac{1}{2}$ Each whole is made of two halves.

$= \frac{2}{2} + \frac{1}{2}$ One whole is two halves.

$= \frac{3}{2}$ Two halves plus one half is three halves.

b. $4\frac{2}{3} = 4 + \frac{2}{3}$ A mixed number is the sum of the whole number and the fraction.

$= \frac{4 \times 3}{3} + \frac{2}{3}$ Each whole is made of three thirds.

$= \frac{12}{3} + \frac{2}{3}$ Four wholes is $4 \times 3 = 12$ thirds.

$= \frac{14}{3}$ Twelve thirds plus two thirds is 14 thirds.

c. $2\frac{1}{4} = 2 + \frac{1}{4}$ A mixed number is the sum of the whole number and the fraction.

$= \frac{2 \times 4}{4} + \frac{1}{4}$ Each whole is made of four quarters.

$= \frac{8}{4} + \frac{1}{4}$ Two wholes is $2 \times 4 = 8$ quarters.

$= \frac{9}{4}$ Eight quarters plus one quarter is nine quarters.

**d.** $\frac{4}{3}$ means $4 \div 3$.

$$\begin{array}{rl} 3\overline{)4}^{\,1} & \text{number of wholes} \\ -\ 3 & \text{number of thirds used} \\ \hline 1 & \text{number of thirds left} \end{array}$$

The mixed number result is one whole plus one third or $1\frac{1}{3}$.

**e.** $\frac{9}{2}$ means $9 \div 2$.

$$\begin{array}{rl} 2\overline{)9}^{\,4} & \text{number of wholes} \\ -\ 8 & \text{number of halves used} \\ \hline 1 & \text{number of halves left} \end{array}$$

The mixed number result is four wholes plus one half or $4\frac{1}{2}$.

**f.** $\frac{11}{4}$ means $11 \div 4$.

$$\begin{array}{rl} 4\overline{)11}^{\,2} & \text{number of wholes} \\ -\ 8 & \text{number of quarters used} \\ \hline 3 & \text{number of quarters left} \end{array}$$

The mixed number result is two wholes plus three quarters or $2\frac{3}{4}$.

**g.**

$$\begin{aligned} 2\frac{1}{8} &= 2+\frac{1}{8} && \text{A mixed number is the sum of the whole number and the fraction.} \\ &= \frac{2\times 8}{8}+\frac{1}{8} && \text{Each whole is made of eight eighths.} \\ &= \frac{16}{8}+\frac{1}{8} && \text{Two wholes is } 2\times 8=16 \text{ eighths.} \\ &= \frac{17}{8} && \text{Sixteen eighths plus one eighth is 17 eighths.} \end{aligned}$$

h. $3\frac{7}{8} = 3 + \frac{7}{8}$ A mixed number is the sum of the whole number and the fraction.

$= \frac{3 \times 8}{8} + \frac{7}{8}$ Each whole is made of eight eighths.

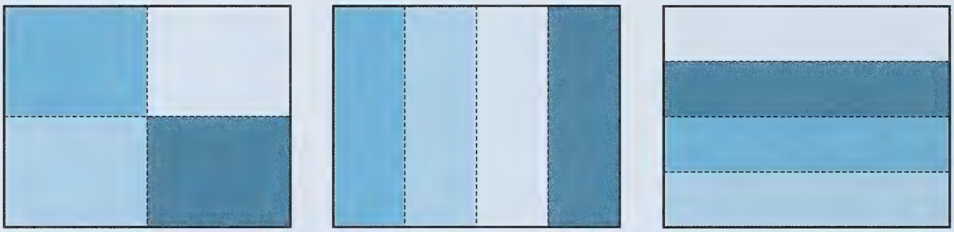
$= \frac{24}{8} + \frac{7}{8}$ Three wholes is $3 \times 8 = 24$ eighths.

$= \frac{31}{8}$ Twenty-four eighths plus seven eighths is 31 eighths.

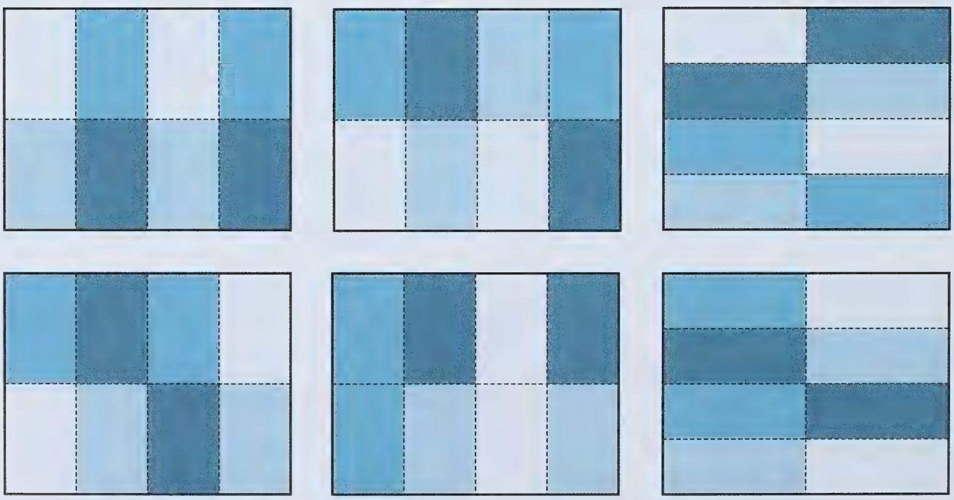
## Lesson 3: Equivalent Fractions

**1. Textbook, page 133, "Investigation," question 1**

1. **a.** Here are several folding possibilities. Each section is coloured differently.

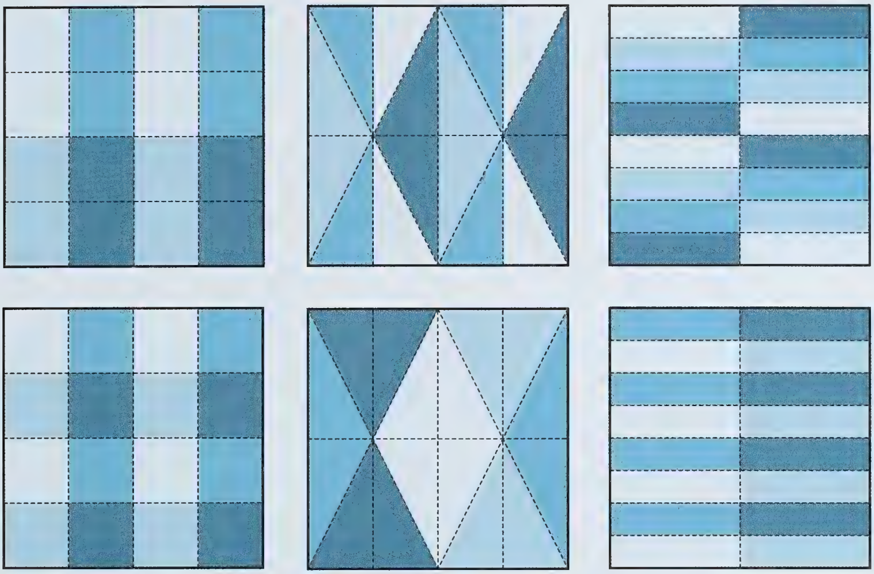


**b.** Here are several folding possibilities. Each friend will get two sections. There are a lot more ways to do the colouring now.



You see that $\frac{1}{4}$ and $\frac{2}{8}$ represent that same amount of the sheet of paper.

c. Here are several folding possibilities. Each friend will get four sections. There are even more ways to do the colouring now.



You see that $\frac{1}{4}$ and $\frac{4}{16}$ represent that same amount of the sheet of paper.

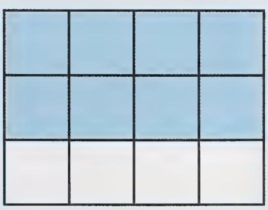
d. The fractions $\frac{1}{4}$, $\frac{2}{8}$, and $\frac{4}{16}$ all represent the same amount of the sheet of paper.

e. The fractions $\frac{8}{32}$, $\frac{16}{64}$, $\frac{32}{128}$, $\frac{3}{12}$, $\frac{5}{20}$, $\frac{6}{24}$, and $\frac{7}{28}$ all represent the same amount of the sheet of paper.

**2. Textbook, page 134, "Investigation," question 2**

2. a. See the first diagram shown in the left margin on page 134 in the textbook.
   b. See the second diagram shown in the left margin on page 134 in the textbook.
   c. The folded pages show that $\frac{4}{6}$ and $\frac{2}{3}$ are equivalent.
   d. Twelfths are shown in the following diagram.

12 squares



3 rows

e. Eight coloured squares out of 12 squares is $\frac{8}{12}$. Two coloured rows out of three is $\frac{2}{3}$. These two fractions are the same part of the whole, so $\frac{2}{3} = \frac{8}{12}$.

f. $\frac{2}{3}$, $\frac{4}{6}$, and $\frac{8}{12}$ each represent the same amount of the sheet of paper.

g. The fractions $\frac{6}{9}$, $\frac{10}{15}$, $\frac{12}{18}$, $\frac{14}{21}$, and $\frac{16}{24}$ all are equivalent to $\frac{2}{3}$.

**3. Textbook, page 135, "Put into Practice," questions 1 and 2**

**1.** Use the multiplier method to find equivalent fractions. Answers may vary. Sample solutions are given.

**a.** Choose three multipliers to get three different equivalent fractions. For example, use 2, 3, and 4 as multipliers.

| **Multiplier 2** | **Multiplier 3** | **Multiplier 4** |
|---|---|---|
| $\frac{3}{5} = \frac{2\times3}{2\times5}$ | $\frac{3}{5} = \frac{3\times3}{3\times5}$ | $\frac{3}{5} = \frac{4\times3}{4\times5}$ |
| $= \frac{6}{10}$ | $= \frac{9}{15}$ | $= \frac{12}{20}$ |

Three fractions that are equivalent to $\frac{3}{5}$ are $\frac{6}{10}$, $\frac{9}{15}$, and $\frac{12}{20}$. Other answers are possible.

**b.** Choose three multipliers to get three different equivalent fractions. For example, use 5, 6, and 7 as multipliers.

| **Multiplier 5** | **Multiplier 6** | **Multiplier 7** |
|---|---|---|
| $\frac{5}{8} = \frac{5\times5}{5\times8}$ | $\frac{5}{8} = \frac{6\times5}{6\times8}$ | $\frac{5}{8} = \frac{7\times5}{7\times8}$ |
| $= \frac{25}{40}$ | $= \frac{30}{48}$ | $= \frac{35}{56}$ |

Three fractions that are equivalent to $\frac{5}{8}$ are $\frac{25}{40}$, $\frac{30}{48}$, and $\frac{35}{56}$. Other answers are possible.

**c.** Choose three multipliers to get three different equivalent fractions. For example, use 2, 4, and 10 as multipliers.

| **Multiplier 2** | **Multiplier 4** | **Multiplier 10** |
|---|---|---|
| $\frac{5}{10}=\frac{2\times5}{2\times10}=\frac{10}{20}$ | $\frac{5}{10}=\frac{4\times5}{4\times10}=\frac{20}{40}$ | $\frac{5}{10}=\frac{10\times5}{10\times10}=\frac{50}{100}$ |

You can use division with this fraction as well. Since 5 is a factor of both 5 and 10, divide both the numerator and the denominator by 5.

$$\frac{5}{10}=\frac{5\div5}{10\div5}$$
$$=\frac{1}{2}$$

Fractions that are equivalent to $\frac{5}{10}$ include $\frac{1}{2}$, $\frac{10}{20}$, $\frac{20}{40}$, and $\frac{50}{100}$. Other answers are possible

**2.** First find the multiplier. Then, use the multiplier to determine the volume of ?.

**a.** $\frac{4}{5}=\frac{?}{100}$

Use the numbers in both denominators to find the multiplier.

$$\begin{array}{r} 20 \\ 5\overline{)100} \\ \underline{100} \\ 0 \end{array}$$

The multiplier is 20.

Remember that the subtraction sign has been omitted. You still get the answer by subtracting.

Find the value of ?.

$$\frac{4}{5}=\frac{4\times20}{5\times20}$$
$$=\frac{80}{100}$$

The value of ? is 80.

b. $\frac{5}{4} = \frac{?}{100}$

Use the numbers in both denominators to find the multiplier.

$$\begin{array}{r} 25 \\ 4\overline{)100} \\ \underline{100} \\ 0 \end{array}$$

The multiplier is 25.

Find the value of ?.

$$\begin{aligned} \frac{5}{4} &= \frac{5 \times 25}{4 \times 25} \\ &= \frac{125}{100} \end{aligned}$$

The value of ? is 125.

c. $\frac{2}{3} = \frac{?}{15}$

Use the numbers in both denominators to find the multiplier.

$$\begin{array}{r} 5 \\ 3\overline{)15} \\ \underline{15} \\ 0 \end{array}$$

The multiplier is 5.

Find the value of ?.

$$\begin{aligned} \frac{2}{3} &= \frac{2 \times 5}{3 \times 5} \\ &= \frac{10}{15} \end{aligned}$$

The value of ? is 10.

d. $\frac{3}{8} = \frac{?}{16}$

Use the numbers in both denominators to find the multiplier.

$$\begin{array}{r} 2 \\ 8\overline{)16} \\ 16 \\ \hline 0 \end{array}$$

The multiplier is 2.

Find the value of ?.

$$\frac{3}{8} = \frac{3 \times 2}{8 \times 2}$$
$$= \frac{6}{16}$$

The value of ? is 6.

e. $\frac{3}{4} = \frac{?}{16}$

Use the numbers in both denominators to find the multiplier.

$$\begin{array}{r} 4 \\ 4\overline{)16} \\ 16 \\ \hline 0 \end{array}$$

The multiplier is 4.

Find the value of ?.

$$\frac{3}{4} = \frac{3 \times 4}{4 \times 4}$$
$$= \frac{12}{16}$$

The value of ? is 12.

f. $\frac{2}{3} = \frac{12}{?}$

Use the numbers in both numerators to find the multiplier.

$$2\overline{)12}^{\;6}$$
$$\frac{12}{0}$$

The multiplier is 6.

Find the value of ?.

$$\frac{2}{3} = \frac{2 \times 6}{3 \times 6}$$
$$= \frac{12}{18}$$

The value of ? is 18.

**4. Textbook, page 137, "Put into Practice," questions 3 and 4**

**3. a. i.** The divisors of 9 are 1, 3, and 9. The divisors of 72 are 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, and 72. The largest common divisor is 9.

$$\frac{9}{72} = \frac{9 \div 9}{72 \div 9}$$
$$= \frac{1}{8}$$

**ii.** The divisors of 3 are 1 and 3. The divisors of 24 are 1, 2, 3, 4, 6, 8, 12, and 24. The largest common divisor is 3.

$$\frac{3}{24} = \frac{3 \div 3}{24 \div 3}$$
$$= \frac{1}{8}$$

**iii.** The divisors of 70 are 1, 2, 5, 7, 10, 14, 35, and 70. The divisors of 100 are 1, 2, 4, 5, 10, 20, 25, 50, and 100. The largest common divisor is 10.

$$\frac{70}{100} = \frac{70 \div 10}{100 \div 10}$$
$$= \frac{7}{10}$$

**iv.** The divisors of 14 are 1, 2, 7, and 14. The divisors of 16 are 1, 2, 4, 8, and 16. The largest common divisor is 2.

$$\frac{14}{16} = \frac{14 \div 2}{16 \div 2}$$
$$= \frac{7}{8}$$

**v.** The divisors of 12 are 1, 2, 3, 4, 6, and 12. The divisors of 16 are 1, 2, 4, 8, and 16. The largest common divisor is 4.

$$\frac{12}{16} = \frac{12 \div 4}{16 \div 4}$$
$$= \frac{3}{4}$$

**vi.** The divisors of 6 are 1, 2, 3, and 6. The divisors of 8 are 1, 2, 4, and 8. The largest common divisor is 2.

$$\frac{6}{8} = \frac{6 \div 2}{8 \div 2}$$
$$= \frac{3}{4}$$

**b.** $\frac{9}{72}$ and $\frac{3}{24}$ are equivalent since they both have the same value as $\frac{1}{8}$. $\frac{12}{16}$ and $\frac{6}{8}$ are equivalent since they both have the same value as $\frac{3}{4}$.

**4.** To change a fraction to its simplest form, follow these steps. Use $\frac{30}{42}$ as an example.

**Step 1:** Find all the factors of the numerator and denominator.

$$30 = 1 \times 30,\ 30 = 2 \times 15,\ 30 = 5 \times 6,\ 30 = 3 \times 10$$
$$42 = 1 \times 42,\ 42 = 2 \times 21,\ 42 = 3 \times 14,\ 42 = 6 \times 7$$

**Step 2:** Use the largest common factor for the next step.

The common factors are 2, 3, and 6. 6 is the largest common factor.

**Step 3:** Divide the numerator and the denominator by the largest common factor.

$$\frac{30}{42} = \frac{30 \div 6}{42 \div 6}$$

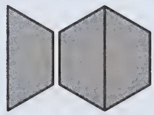
**Step 4:** The resulting fraction will be in simplest form.

$$\frac{5}{7}$$

## Lesson 4: Adding and Subtracting Fractions

1. **Textbook, pages 138 and 139, "Investigation," questions 1 to 3**

1. a. The red trapezoid represents $\frac{1}{4}$ of the whole. Two red trapezoids represent $\frac{2}{4}$ of the whole. $\frac{1}{4}+\frac{2}{4}$ can be represented as shown.

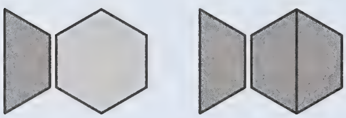


b. $\frac{1}{4}+\frac{2}{4}=\frac{3}{4}$

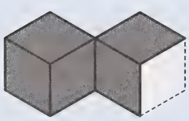
From the previous diagram, you see that there are three quarters.

c. $\frac{1}{4}+\frac{1}{2}=\frac{3}{4}$

From the following diagrams, you see that there are three quarters.
The yellow hexagon represents $\frac{1}{2}$ and is the same as two red trapezoids.



2. a. The blue rhombus represents $\frac{1}{6}$ of the whole.
$\frac{4}{6}+\frac{1}{6}$ can be modelled as follows.

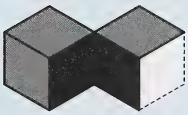


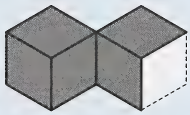
**b.** $\frac{4}{6}+\frac{1}{6}=\frac{5}{6}$

From the previous diagram, you see that there are five sixths.

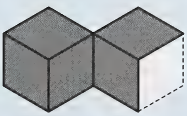
$\frac{2}{3}+\frac{1}{6}=\frac{5}{6}$

From the following diagrams, you see that there are five sixths.
The black chevron represents $\frac{1}{3}$ and is the same as two blue rhombi.

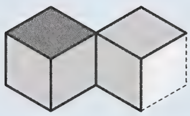




**3. a.**



**b.**



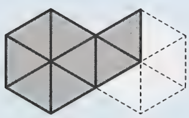
There would be 1 rhombus left.

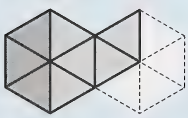
**c. i.** $\frac{5}{6}-\frac{4}{6}=\frac{1}{6}$

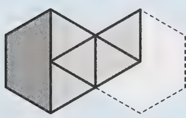
**ii.** $\frac{5}{6}-\frac{2}{3}=\frac{5}{6}-\frac{4}{6}$
$=\frac{1}{6}$

**2. Textbook, page 139, "Put into Practice," questions 1 to 4**

**1. a.** $\frac{8}{12}-\frac{5}{12}=\frac{8-5}{12}$
$=\frac{3}{12}$
$=\frac{3\div 3}{12\div 3}$
$=\frac{1}{4}$







**b.** $\frac{2}{3}-\frac{5}{12}=\frac{2\times4}{3\times4}-\frac{5}{12}$

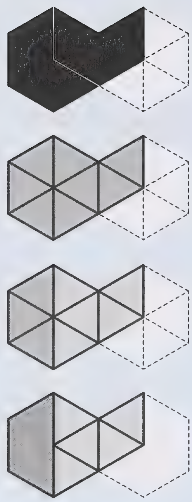
$=\frac{8}{12}-\frac{5}{12}$

$=\frac{8-5}{12}$

$=\frac{3}{12}$

$=\frac{3\div3}{12\div3}$

$=\frac{1}{4}$



**2. a.** $\frac{1}{3}+\frac{1}{3}=\frac{1+1}{3}$

$=\frac{2}{3}$

**b.** $\frac{1}{5}+\frac{2}{5}=\frac{1+2}{5}$

$=\frac{3}{5}$

**c.** $\frac{3}{10}+\frac{1}{10}+\frac{3}{10}=\frac{3+1+3}{10}$

$=\frac{7}{10}$

**d.** $\frac{3}{100}+\frac{1}{100}+\frac{7}{100}=\frac{3+1+7}{100}$

$=\frac{11}{100}$

**e.** $\frac{4}{5}-\frac{1}{5}=\frac{4-1}{5}$

$=\frac{3}{5}$

**f.** $\frac{14}{5}-\frac{10}{5}=\frac{14-10}{5}$

$=\frac{4}{5}$

**g.** $\frac{15}{5}-\frac{10}{5}=\frac{15-10}{5}$

$=\frac{5}{5}$

$=1$

**h.** $\frac{9}{10}+\frac{1}{10}-\frac{7}{10}=\frac{9+1-7}{10}$

$=\frac{3}{10}$

3. a. Use 6 as a common denominator.

$$\begin{aligned}\frac{2}{3}+\frac{1}{6}&=\frac{2\times 2}{3\times 2}+\frac{1}{6}\\&=\frac{4}{6}+\frac{1}{6}\\&=\frac{4+1}{6}\\&=\frac{5}{6}\end{aligned}$$

b. Use 10 as a common denominator.

$$\begin{aligned}\frac{7}{10}-\frac{3}{5}&=\frac{7}{10}-\frac{3\times 2}{5\times 2}\\&=\frac{7}{10}-\frac{6}{10}\\&=\frac{7-6}{10}\\&=\frac{1}{10}\end{aligned}$$

c. Use 12 as a common denominator.

$$\begin{aligned}\frac{7}{12}-\frac{1}{3}&=\frac{7}{12}-\frac{1\times 4}{3\times 4}\\&=\frac{7}{12}-\frac{4}{12}\\&=\frac{7-4}{12}\\&=\frac{3}{12}\\&=\frac{3\div 3}{12\div 3} && \text{Simplify.}\\&=\frac{1}{4}\end{aligned}$$

d. Use 6 as a common denominator.

$$\begin{aligned}\frac{5}{6}+\frac{1}{2}&=\frac{5}{6}+\frac{1\times 3}{2\times 3}\\&=\frac{5}{6}+\frac{3}{6}\\&=\frac{5+3}{6}\\&=\frac{8}{6}\\&=1\frac{2}{6} && \text{Change to a mixed number.}\\&=1\frac{1}{3} && \text{Simplify.}\end{aligned}$$

4. a. i. For fractions with the same denominator, the numerators are added when adding the fractions.

ii. For fractions with the same denominator, the denominator is unchanged when adding the fractions.

b. i. For fractions with the same denominator, the numerators are subtracted when subtracting the fractions.

ii. For fractions with the same denominator, the denominator is unchanged when adding the fractions.

3. **Textbook, page 143, "Put into Practice," questions 5 to 8**

5. **a.** Use 6 as a common denominator.

$$\frac{1}{3}+\frac{1}{6}=\frac{1\times 2}{3\times 2}+\frac{1}{6}$$
$$=\frac{2+1}{6}$$
$$=\frac{3}{6}$$
$$=\frac{1}{2}$$ Simplify.

**b.** Use 8 as a common denominator.

$$\frac{3}{8}+\frac{1}{2}=\frac{3}{8}+\frac{1\times 4}{2\times 4}$$
$$=\frac{3+4}{8}$$
$$=\frac{7}{8}$$

**c.** $$1\frac{3}{4}+2\frac{1}{8}=\frac{(1\times 4)+3}{4}+\frac{(2\times 8)+1}{8}$$
$$=\frac{7}{4}+\frac{17}{8}$$ Change to improper fractions.
$$=\frac{7\times 2}{4\times 2}+\frac{17}{8}$$
$$=\frac{14+17}{8}$$ Use 8 as a common denominator.
$$=\frac{31}{8}$$
$$=3\frac{7}{8}$$ Change the answer to a mixed number.

**d.** Use 100 as a common denominator.

$$\frac{3}{10}+\frac{7}{100}=\frac{3\times 10}{10\times 10}+\frac{7}{100}$$
$$=\frac{30+7}{100}$$
$$=\frac{37}{100}$$

**e.** Use 100 as a common denominator.

$$\frac{3}{10}-\frac{7}{100}=\frac{3\times 10}{10\times 10}-\frac{7}{100}$$
$$=\frac{30-7}{100}$$
$$=\frac{23}{100}$$

**f.** Use 6 as a common denominator.

$$\begin{aligned}\frac{1}{3}-\frac{1}{6}&=\frac{1\times 2}{3\times 2}-\frac{1}{6}\\&=\frac{2-1}{6}\\&=\frac{1}{6}\end{aligned}$$

**g.** Use improper fractions.

$$\begin{aligned}1\frac{5}{8}-\frac{1}{2}&=\frac{(1\times 8)+5}{8}-\frac{1}{2}\\&=\frac{13}{8}-\frac{1}{2}\\&=\frac{13}{8}-\frac{1\times 4}{2\times 4}\\&=\frac{13-4}{8} && \text{Use 8 as a common denominator.}\\&=\frac{9}{8}\\&=1\frac{1}{8} && \text{Change to a mixed number.}\end{aligned}$$

**h.** Use improper fractions.

$$\begin{aligned}2\frac{3}{4}-1\frac{1}{8}&=\frac{(2\times 4)+3}{4}-\frac{(1\times 8)+1}{8}\\&=\frac{11}{4}-\frac{9}{8}\\&=\frac{11\times 2}{4\times 2}-\frac{9}{8}\\&=\frac{22-9}{8} && \text{Use 8 as a common denominator.}\\&=\frac{13}{8}\\&=1\frac{5}{8} && \text{Change to a mixed number.}\end{aligned}$$

**i.** Use 12 as a common denominator.

$$\begin{aligned}\frac{5}{6}+\frac{5}{12}&=\frac{5\times 2}{6\times 2}+\frac{5}{12}\\&=\frac{10+5}{12}\\&=\frac{15}{12}\\&=1\frac{3}{12} && \text{Change to a mixed number.}\\&=1\frac{1}{4} && \text{Simplify.}\end{aligned}$$

**j.** Use 12 as a common denominator.

$$\frac{5}{6}-\frac{5}{12}=\frac{5\times2}{6\times2}-\frac{5}{12}$$
$$=\frac{10-5}{12}$$
$$=\frac{5}{12}$$

**k.** Use improper fractions.

$$2\frac{1}{3}-1\frac{5}{6}=\frac{(2\times3)+1}{3}-\frac{(1\times6)+5}{6}$$
$$=\frac{7}{3}-\frac{11}{6}$$
$$=\frac{7\times2}{3\times2}-\frac{11}{6}$$
$$=\frac{14-11}{6}$$ Use 6 as a common denominator.
$$=\frac{3}{6}$$
$$=\frac{1}{2}$$ Simplify.

**l.** Use improper fractions.

$$2\frac{1}{3}+1\frac{5}{6}=\frac{(2\times3)+1}{3}+\frac{(1\times6)+5}{6}$$
$$=\frac{7}{3}+\frac{11}{6}$$
$$=\frac{7\times2}{3\times2}+\frac{11}{6}$$
$$=\frac{14+11}{6}$$ Use 6 as a common denominator.
$$=\frac{25}{6}$$
$$=4\frac{1}{6}$$ Change to a mixed number.

6. a. Use $2 \times 3 = 6$ as a common denominator.

$$\begin{aligned}\frac{2}{3}+\frac{1}{2} &= \frac{2\times 2}{3\times 2}+\frac{1\times 3}{2\times 3}\\ &= \frac{4+3}{6}\\ &= \frac{7}{6}\\ &= 1\frac{1}{6}\end{aligned}$$

Change to a mixed number.

b. Use improper fractions.

$$\begin{aligned}1\frac{2}{5}+\frac{1}{2} &= \frac{(1\times 5)+2}{5}+\frac{1}{2}\\ &= \frac{7}{5}+\frac{1}{2}\\ &= \frac{7\times 2}{5\times 2}+\frac{1\times 5}{2\times 5}\\ &= \frac{14+5}{10}\\ &= \frac{19}{10}\\ &= 1\frac{9}{10}\end{aligned}$$

Use $5 \times 2 = 10$ as a common denominator.

Change to a mixed number.

c. Use improper fractions.

$$\begin{aligned}2\frac{2}{3}+1\frac{1}{4} &= \frac{(2\times 3)+2}{3}+\frac{(1\times 4)+1}{4}\\ &= \frac{8}{3}+\frac{5}{4}\\ &= \frac{8\times 4}{3\times 4}+\frac{5\times 3}{4\times 3}\\ &= \frac{32+15}{12}\\ &= \frac{47}{12}\\ &= 3\frac{11}{12}\end{aligned}$$

Use $3 \times 4 = 12$ as a common denominator.

Change to a mixed number.

d. Use $2 \times 3 = 6$ as a common denominator.

$$\begin{aligned}\frac{2}{3}-\frac{1}{2} &= \frac{2\times 2}{3\times 2}-\frac{1\times 3}{2\times 3}\\ &= \frac{4-3}{6}\\ &= \frac{1}{6}\end{aligned}$$

**e.** Use improper fractions.

$$
\begin{aligned}
1\frac{2}{5}-\frac{1}{2} &= \frac{(1\times 5)+2}{5}-\frac{1}{2}\\
&= \frac{7}{5}-\frac{1}{2}\\
&= \frac{7\times 2}{5\times 2}-\frac{1\times 5}{2\times 5}\\
&= \frac{14-5}{10}\\
&= \frac{9}{10}
\end{aligned}
$$

Use $5\times 2=10$ as a common denominator.

**f.** Use improper fractions.

$$
\begin{aligned}
2\frac{2}{3}-1\frac{1}{4} &= \frac{(2\times 3)+2}{3}-\frac{(1\times 4)+1}{4}\\
&= \frac{8}{3}-\frac{5}{4}\\
&= \frac{8\times 4}{3\times 4}-\frac{5\times 3}{4\times 3}\\
&= \frac{32-15}{12}\\
&= \frac{17}{12}\\
&= 1\frac{5}{12}
\end{aligned}
$$

Use $3\times 4=12$ as a common denominator.

Change to a mixed number.

**7.** Debra will spend $\frac{3}{4}$ h shopping. Debra also will spend $\frac{3}{4}$ h tidying her room. In total, she will spend $\frac{3}{4}+\frac{3}{4}=\frac{3+3}{4}$ h or $\frac{6}{4}=1\frac{2}{4}$ h. In simplest form, this is $1\frac{1}{2}$ h. It will take her one-and-a-half hours to prepare before her friends arrive.

**8.** Denver will spend $1\frac{3}{4}$ h tuning up his car. He will spend $\frac{1}{3}$ h washing it. Denver also will spend $1\frac{1}{4}$ h polishing his car. In total, Denver will spend $1\frac{3}{4}+\frac{1}{3}+1\frac{1}{4}$ h.

$$
\begin{aligned}
1\frac{3}{4}+\frac{1}{3}+1\frac{1}{4} &= \frac{(1\times 4)+3}{4}+\frac{1}{3}+\frac{(1\times 4)+1}{4}\\
&= \frac{7}{4}+\frac{1}{3}+\frac{5}{4}\\
&= \frac{7\times 3}{4\times 3}+\frac{1\times 4}{3\times 4}+\frac{5\times 3}{4\times 3}\\
&= \frac{21+4+15}{12}\\
&= \frac{40}{12}\\
&= 3\frac{4}{12}\\
&= 3\frac{1}{3}
\end{aligned}
$$

Change to improper fractions.

Use 12 as a common denominator.

Change to a mixed number.

Denver will spend $3\frac{1}{3}$ h or 3 h and 20 min working on his car.

4.

| Number | Keystrokes | Number | Keystrokes |
|---|---|---|---|
| $\frac{1}{2}$ | 1 Ab/c 2 | $\frac{12}{71}$ | 1 2 Ab/c 7 1 |
| $\frac{5}{9}$ | 5 Ab/c 9 | $8\frac{1}{5}$ | 8 Ab/c 1 Ab/c 5 |
| $\frac{15}{16}$ | 1 5 Ab/c 1 6 | $5\frac{2}{15}$ | 5 Ab/c 2 Ab/c 1 5 |

5. a.

| Calculation | Keystrokes |
|---|---|
| $\frac{1}{2}+\frac{12}{24}$ | 1 Ab/c 2 + 1 2 Ab/c 2 4 ENTER =<br>Use 2nd Ab/c◂▸d/e to change to an improper fraction.<br>Use 2nd F◂▸D to change to a decimal fraction. |
| $8\frac{1}{5}-7\frac{9}{10}$ | 8 Ab/c 1 Ab/c 5 − 7 Ab/c 9 Ab/c 1 0 ENTER =<br>Use 2nd Ab/c◂▸d/e to change to an improper fraction.<br>Use 2nd F◂▸D to change to a decimal fraction. |
| $\frac{15}{16}+5\frac{2}{15}$ | 1 5 Ab/c 1 6 + 5 Ab/c 2 Ab/c 1 5 ENTER =<br>Use 2nd Ab/c◂▸d/e to change to an improper fraction.<br>Use 2nd F◂▸D to change to a decimal fraction. |

b.

| Calculation | Calculated Result | As an Improper Fraction | As a Decimal Fraction |
|---|---|---|---|
| $\frac{1}{2}+\frac{12}{24}$ | 1 | 1 | 1 |
| $8\frac{1}{5}-7\frac{9}{10}$ | 3/10 | 3/10 | 0.3 |
| $\frac{15}{16}+5\frac{2}{15}$ | 6⌴17/240 | 1457/240 | 6.070 833 333 |

6. **Textbook, page 144, "Put into Practice," questions 9 to 11**

**9.** To find how many pizzas were needed, you add the four orders.

$$\begin{aligned}\frac{1}{2}+\frac{1}{6}+\frac{1}{4}+\frac{5}{12} &= \frac{1\times6}{2\times6}+\frac{1\times2}{6\times2}+\frac{1\times3}{4\times3}+\frac{5}{12}\\ &= \frac{6+2+3+5}{12} && \text{Use 12 as a common denominator.}\\ &= \frac{16}{12}\\ &= 1\frac{4}{12} && \text{Change to a mixed number.}\\ &= 1\frac{1}{3} && \text{Simplify.}\end{aligned}$$

Darlene needed $1\frac{1}{3}$ pizzas to fill their orders.

**10.** To find the time the keyboard was used, you need to add the four times.

$$\begin{aligned}\frac{1}{4}+\frac{1}{3}+\frac{1}{3}+\frac{1}{2} &= \frac{1\times3}{4\times3}+\frac{1\times4}{3\times4}+\frac{1\times4}{3\times4}+\frac{1\times6}{2\times6}\\ &= \frac{3+4+4+6}{12} && \text{Use 12 as a common denominator.}\\ &= \frac{17}{12}\\ &= 1\frac{5}{12} && \text{Change to a mixed number.}\end{aligned}$$

The keyboard was used $1\frac{5}{12}$ h or 1 h and 25 min.

11. To find the time spent, you need to add the four times.

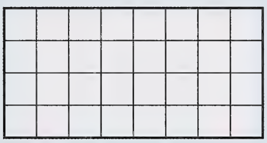
$$
\begin{aligned}
7\frac{1}{2}+4\frac{1}{2}+1\frac{1}{2}+9\frac{1}{2} &= \frac{(7\times 2)+1}{2}+\frac{(4\times 2)+1}{2}+\frac{(1\times 2)+1}{2}+\frac{(9\times 2)+1}{2} \\
&= \frac{15+9+3+19}{2} \quad \text{Change to an improper fraction.} \\
&= \frac{46}{2} \\
&= 23
\end{aligned}
$$

The four students spent 23 h working on the home.

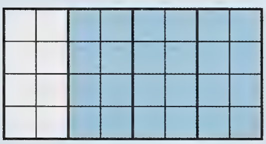
## Lesson 5: Multiplying Fractions

**1. Textbook, page 145, "Investigation," question 1**

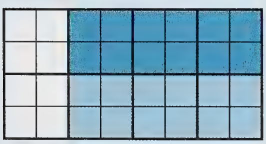
**1.**



Create an 8-by-4 poster on graph paper.



Three quarters are shaded.



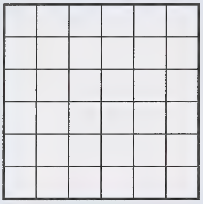
Half of the three quarters are shaded again.

The diagram shows that three eighths of the poster have been shaded twice.

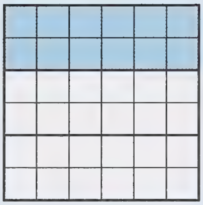
$\frac{1}{2}$ of $\frac{3}{4} = \boxed{\frac{3}{8}}$

2. **Textbook, pages 146 and 147, "Investigation," questions 2 to 5**

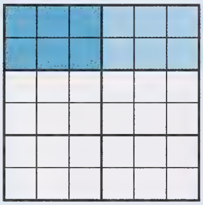
**2. a.**



Draw a 6-by-6 square on graph paper.



One third is shaded.



One half of one third is shaded.

$\frac{1}{2}$ of $\frac{1}{3} = \frac{1}{6}$

**b. i.** The numerator is 1. It is the product of the numerators.

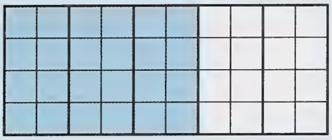
**ii.** The denominator is 6. It is the product of the denominators.

**c.** $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$

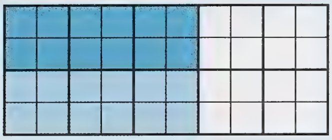
**d.** $\frac{1 \times 1}{2 \times 3} = \frac{1}{6}$

**3. a.**

Draw a 4-by-10 rectangle on graph paper.



Three fifths are shaded.



One half of three fifths are darkly shaded.

$$\frac{1}{2} \text{ of } \frac{3}{5} = \frac{3}{10}$$

**b.** **i.** The numerator is 3. It is the product of the numerators.

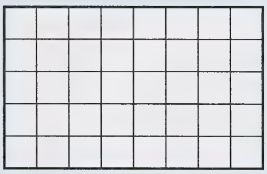
**ii.** The denominator is 10. It is the product of the denominators.

**c.** $\frac{1}{2}$ of $\frac{3}{5}$ means $\frac{1}{2} \times \frac{3}{5}$.

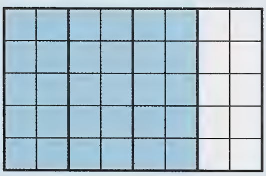
$$\frac{1}{2} \times \frac{3}{5} = \frac{3}{10}$$

**d.** $$\frac{1 \times 3}{2 \times 5} = \frac{3}{10}$$

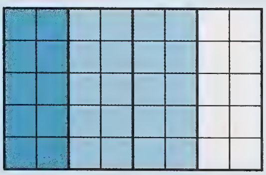
**4.** **a.**



Draw a 5-by-8 rectangle on graph paper.



Three quarters are shaded.



One third of three quarters are darkly shaded.

$$\frac{1}{3} \text{ of } \frac{3}{4} = \frac{3}{12}$$
$$= \frac{3 \div 3}{12 \div 3}$$
$$= \frac{1}{4}$$

**b.** $\frac{1}{3}$ of $\frac{3}{4}$ means $\frac{1}{3} \times \frac{3}{4}$.

$$\frac{1}{3} \times \frac{3}{4} = \frac{3}{12}$$
$$= \frac{3 \div 3}{12 \div 3}$$
$$= \frac{1}{4}$$

**c.** $$\frac{1 \times 3}{3 \times 4} = \frac{3}{12}$$
$$= \frac{3 \div 3}{12 \div 3}$$
$$= \frac{1}{4}$$

**d.** The answers to a., b., and c. are all the same.

**5.** To multiply two fractions $\left(\text{for example, } \frac{2}{3} \text{ and } \frac{5}{7}\right)$, follow these steps:

- Multiply the numerators.

$$2 \times 5 = 10$$

- Multiply the denominators.

$$3 \times 7 = 21$$

- Use these products as the numerator and denominator of the product.

$$\frac{2}{3} \times \frac{5}{7} = \frac{10}{21}$$

**3. Textbook, pages 148 and 149, "Put into Practice," questions 1 to 4**

**1.** Calculate $\frac{1}{2}$ of $\frac{4}{5}$.

$$\begin{aligned}\frac{1}{2} \text{ of } \frac{4}{5} &= \frac{1}{2} \times \frac{4}{5} \\ &= \frac{1 \times 4}{2 \times 5} \\ &= \frac{4}{10} \\ &= \frac{4 \div \boxed{2}}{10 \div \boxed{2}} \\ &= \frac{2}{5}\end{aligned}$$

Peter is left with $\frac{2}{5}$ of a roll of paper.

**2.** $$\begin{aligned}\frac{5}{8} \times \frac{16}{25} &= \frac{5 \times \boxed{16}}{8 \times 25} \\ &= \frac{(5 \div 5) \times (16 \div \boxed{8})}{(8 \div 8) \times (25 \div 5)} \\ &= \frac{1 \times 2}{1 \times 5} \\ &= \frac{\boxed{2}}{\boxed{5}}\end{aligned}$$

Both 5 and 25 can be divided by 5.

Both 16 and 8 can be divided by 8.

**3. a.** $$\begin{aligned}\frac{1}{2} \times \frac{1}{8} &= \frac{1 \times 1}{2 \times 8} \\ &= \frac{1}{16}\end{aligned}$$

**b.** $$\begin{aligned}\frac{1}{4} \times \frac{1}{3} &= \frac{1 \times 1}{4 \times 3} \\ &= \frac{1}{12}\end{aligned}$$

c. $\frac{1}{3}\times\frac{1}{4}=\frac{1\times1}{3\times4}$

$=\frac{1}{12}$

d. $\frac{2}{3}\times\frac{1}{4}=\frac{2\times1}{3\times4}$

$=\frac{(2\div2)\times1}{3\times(4\div2)}$ Both 2 and 4 can be divided by 2.

$=\frac{1\times1}{3\times2}$

$=\frac{1}{6}$

e. $\frac{2}{3}\times\frac{3}{4}=\frac{2\times3}{3\times4}$

$=\frac{(2\div2)\times(3\div3)}{(3\div3)\times(4\div2)}$ Both 2 and 4 can be divided by 2.
Both 3 and 3 can be divided by 3.

$=\frac{1\times1}{1\times2}$

$=\frac{1}{2}$

4. a. $\frac{1}{2}\times\frac{2}{3}\times\frac{3}{4}\times\frac{4}{5}\times\frac{5}{6}\times\frac{6}{7}=\frac{1\times2\times3\times4\times5\times6}{2\times3\times4\times5\times6\times7}$

$=\frac{1\times(2\div2)\times(3\div3)\times(4\div4)\times(5\div5)\times(6\div6)}{(2\div2)\times(3\div3)\times(4\div4)\times(5\div5)\times(6\div6)\times7}$

$=\frac{1\times1\times1\times1\times1\times1}{1\times1\times1\times1\times1\times7}$

$=\frac{1}{7}$

You will often see the divisions in this question written as follows. It's a shorthand way of writing these calculations.

$$\frac{1}{2}\times\frac{2}{3}\times\frac{3}{4}\times\frac{4}{5}\times\frac{5}{6}\times\frac{6}{7}=\frac{1\times2\times3\times4\times5\times6}{2\times3\times4\times5\times6\times7}$$

$$=\frac{1\times\overset{1}{\cancel{2}}\times\overset{1}{\cancel{3}}\times\overset{1}{\cancel{4}}\times\overset{1}{\cancel{5}}\times\overset{1}{\cancel{6}}}{\underset{1}{\cancel{2}}\times\underset{1}{\cancel{3}}\times\underset{1}{\cancel{4}}\times\underset{1}{\cancel{5}}\times\underset{1}{\cancel{6}}\times7}$$

$$=\frac{1}{7}$$

**b.** Multiply the denominators to get the denominator. Multiply the numerators to get the numerator.

**c. i.** $$\frac{1}{2}\times\frac{2}{3}\times\frac{3}{4}\times\frac{4}{5}\times\frac{5}{6}\times\frac{6}{7}\times\frac{7}{8}\times\frac{8}{9}=\frac{1\times2\times3\times4\times5\times6\times7\times8}{2\times3\times4\times5\times6\times7\times8\times9}$$
$$=\frac{1\times\overset{1}{\cancel{2}}\times\overset{1}{\cancel{3}}\times\overset{1}{\cancel{4}}\times\overset{1}{\cancel{5}}\times\overset{1}{\cancel{6}}\times\overset{1}{\cancel{7}}\times\overset{1}{\cancel{8}}}{\underset{1}{\cancel{2}}\times\underset{1}{\cancel{3}}\times\underset{1}{\cancel{4}}\times\underset{1}{\cancel{5}}\times\underset{1}{\cancel{6}}\times\underset{1}{\cancel{7}}\times\underset{1}{\cancel{8}}\times9}$$
$$=\frac{1}{9}$$

**ii.** $$\frac{2}{3}\times\frac{3}{4}\times\frac{4}{5}\times\frac{5}{6}\times\frac{6}{7}\times\frac{7}{8}\times\frac{8}{9}\times\frac{9}{10}\times\frac{10}{11}=\frac{2\times3\times4\times5\times6\times7\times8\times9\times10}{3\times4\times5\times6\times7\times8\times9\times10\times11}$$
$$=\frac{2\times\overset{1}{\cancel{3}}\times\overset{1}{\cancel{4}}\times\overset{1}{\cancel{5}}\times\overset{1}{\cancel{6}}\times\overset{1}{\cancel{7}}\times\overset{1}{\cancel{8}}\times\overset{1}{\cancel{9}}\times\overset{1}{\cancel{10}}}{\underset{1}{\cancel{3}}\times\underset{1}{\cancel{4}}\times\underset{1}{\cancel{5}}\times\underset{1}{\cancel{6}}\times\underset{1}{\cancel{7}}\times\underset{1}{\cancel{8}}\times\underset{1}{\cancel{9}}\times\underset{1}{\cancel{10}}\times11}$$
$$=\frac{2}{11}$$

**4. Textbook, page 150, "Put into Practice," questions 5 to 8**

**5. a.** $$1\frac{2}{5}\times2\frac{1}{2}=\frac{(1\times5)+2}{5}\times\frac{(2\times2)+1}{2}$$
$$=\frac{7}{5}\times\frac{5}{2}$$
$$=\frac{7\times\overset{1}{\cancel{5}}}{\underset{1}{\cancel{5}}\times2}$$
$$=\frac{7}{2}$$
$$=3\frac{1}{2}$$

**b.** $$1\frac{1}{3}\times2\frac{1}{4}=\frac{(1\times3)+1}{3}\times\frac{(2\times4)+1}{4}$$
$$=\frac{4}{3}\times\frac{9}{4}$$
$$=\frac{\overset{1}{\cancel{4}}\times\overset{3}{\cancel{9}}}{\underset{1}{\cancel{3}}\times\underset{1}{\cancel{4}}}$$
$$=\frac{3}{1}$$
$$=3$$

c. $2\frac{1}{10} \times 1\frac{2}{3} = \frac{(2\times 10)+1}{10} \times \frac{(1\times 3)+2}{3}$

$= \frac{21}{10} \times \frac{5}{3}$

$= \frac{\overset{7}{\cancel{21}} \times \overset{1}{\cancel{5}}}{\underset{2}{\cancel{10}} \times \underset{1}{\cancel{3}}}$

$= \frac{7}{2}$

$= 3\frac{1}{2}$

d. $1.4 \times 2.5 = \frac{14}{10} \times \frac{25}{10}$

$= \frac{(14 \div 2) \times (25 \div 5)}{(10 \div 2) \times (10 \div 5)}$

$= \frac{7 \times \overset{1}{\cancel{5}}}{\underset{1}{\cancel{5}} \times 2}$

$= \frac{7 \times 1}{1 \times 2}$

$= \frac{7}{2}$

$= 3\frac{1}{2}$

e. $2\frac{1}{3} \times 1\frac{1}{4} = \frac{(2\times 3)+1}{3} \times \frac{(1\times 4)+1}{4}$

$= \frac{7}{3} \times \frac{5}{4}$

$= \frac{35}{12}$

$= 2\frac{11}{12}$

f. $1\frac{1}{10} \times 2\frac{1}{3} = \frac{(1\times 10)+1}{10} \times \frac{(2\times 3)+1}{3}$

$= \frac{11}{10} \times \frac{7}{3}$

$= \frac{77}{30}$

$= 2\frac{17}{30}$

6. He has enough flour to make $4\frac{1}{2}$ times the given recipe. The original recipe asks for $1\frac{1}{3}$ cups of chocolate chips. Filipe will need $4\frac{1}{2}$ times $1\frac{1}{3}$ cups of chocolate chips.

$4\frac{1}{2} \times 1\frac{1}{3} = \frac{(4\times 2)+1}{2} \times \frac{(1\times 3)+1}{3}$

$= \frac{9}{2} \times \frac{4}{3}$

$= \frac{\overset{3}{\cancel{9}} \times \overset{2}{\cancel{4}}}{\underset{1}{\cancel{2}} \times \underset{1}{\cancel{3}}}$

$= \frac{3 \times 2}{1 \times 1}$

$= \frac{6}{1}$

$= 6$

Filipe needs 6 cups of chocolate chips.

7. $\frac{1}{2}$ of the people voted.

$\frac{2}{3}$ of the people voting voted in favour.

$\frac{1}{2}$ of $\frac{2}{3}$ of the people voted in favour.

$$\begin{aligned}\frac{1}{2}\times\frac{2}{3}&=\frac{1\times\cancelto{1}{2}}{\cancelto{1}{2}\times 3}\\&=\frac{1\times 1}{1\times 3}\\&=\frac{1}{3}\end{aligned}$$

One third $\left(\frac{1}{3}\right)$ of the people voted for the subdivision.

8. Rachel will need $1\frac{1}{4}$ times as much soil as Zachary.

$$\begin{aligned}1\frac{1}{4}\times 10\frac{1}{2}&=\frac{(1\times 4)+1}{4}\times\frac{(10\times 2)+1}{2}\\&=\frac{5}{4}\times\frac{21}{2}\\&=\frac{105}{8}\\&=13\frac{1}{8}\end{aligned}$$

Rachel needs more than 13 bags. She needs to buy 14 bags of potting soil.

## Lesson 6: Dividing Fractions

**1. Textbook, pages 151 and 152, "Put into Practice," question 1 to 4**

**1. a. i.** There are two thirds in $\frac{2}{3}$. You can count the red parts in the circle.

**ii.** $\frac{2}{3} \div \frac{1}{3} = 2$

**b. i.** There are six halves in 3. You can count the half-squares.

**ii.** $3 \div \frac{1}{2} = 6$

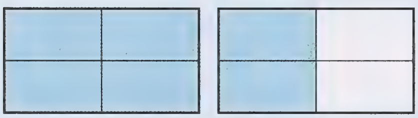
**c. i.** There are eight fifths in $\frac{8}{5}$. You can count the green sections.

**ii.** $\frac{8}{5} \div \frac{1}{5} = 8$

**2.** Ms. Davis has $2\frac{1}{2}$ yd of material. She uses $\frac{1}{2}$ yd per tablemat. She can divide each yard into 2 half-yards. This means she will be able to make 5 tablemats.

$$\begin{aligned} 2\frac{1}{2} \div \frac{1}{2} &= \frac{5}{2} \div \frac{1}{2} \\ &= 5 \end{aligned}$$

**3.** The show was $1\frac{1}{2}$ h long. Each act was $\frac{15}{60} = \frac{1}{4}$ h long. The hour and a half can be divided into 6 quarter-hours. There would be 6 acts in the show.



$$\begin{aligned} 1\frac{1}{2} \div \frac{1}{4} &= \frac{3}{2} \div \frac{1}{4} \\ &= 6 \end{aligned}$$

**4.** Each minute can hold 3 commercials of $\frac{1}{3}$ min each. Three minutes can hold 3 times that number. There would be 9 commercials in 3 min.

$$\begin{aligned} 3 \div \frac{1}{3} &= \frac{3}{1} \div \frac{1}{3} \\ &= 9 \end{aligned}$$

**2. Textbook, pages 153 and 154, "Investigation," questions 1 and 2**

**1. a.** It takes two yellow hexagons to cover a pink double hexagon. (This is shown in the diagram beside part a. in the textbook.)

There are two halves in 1.

$$1 \div \frac{1}{2} = \frac{2}{1}$$

**b.** It takes six blue rhombi to cover a pink double hexagon. (This is shown in the diagram beside part b. in the textbook.)

There are six sixths in 1.

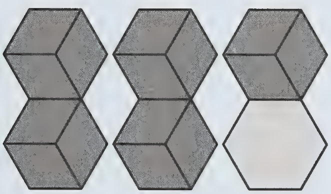
$$1 \div \frac{1}{6} = \frac{6}{1}$$

**c.** It takes 12 green triangles to cover a pink double hexagon. (This is shown in the diagram beside part c. in the textbook.)

There are 12 twelfths in 1.

$$1 \div \frac{1}{12} = \frac{12}{1}$$

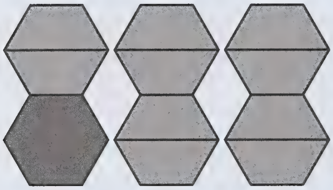
**2.** A blue rhombus represents $\frac{1}{6}$.
It takes six rhombi to cover a double hexagon.
It takes 15 rhombi to cover $2\frac{1}{2}$ double hexagons.



$$\begin{aligned} 2\frac{1}{2} \div \frac{1}{6} &= \frac{5}{2} \div \frac{1}{6} \\ &= \frac{\overset{15}{\cancel{30}}}{\underset{1}{\cancel{2}}} \\ &= \frac{15}{1} \\ &= 15 \end{aligned}$$

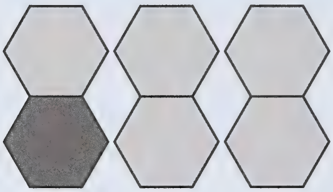
3. **Textbook, page 154, "Put into Practice," questions 5 to 7**

**5.** A red trapezoid represents $\frac{1}{4}$. It takes ten trapezoids to cover $2\frac{1}{2}$ double hexagons.



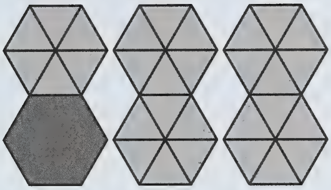
$$
\begin{aligned}
2\frac{1}{2} \div \frac{1}{4} &= \frac{(2\times 2)+1}{2} \div \frac{1}{4} \\
&= \frac{5}{2} \div \frac{1}{4} \\
&= \frac{5}{\cancel{2}_1} \times \frac{\cancel{4}^2}{1} \\
&= \frac{10}{1} \\
&= 10
\end{aligned}
$$

**6.** A yellow hexagon represents $\frac{1}{2}$. It takes five yellow hexagons to cover $2\frac{1}{2}$ double hexagons.



$$
\begin{aligned}
2\frac{1}{2} \div \frac{1}{2} &= \frac{(2\times 2)+1}{2} \div \frac{1}{2} \\
&= \frac{5}{2} \div \frac{1}{2} \\
&= \frac{5}{\cancel{2}_1} \times \frac{\cancel{2}^1}{1} \\
&= \frac{5}{1} \\
&= 5
\end{aligned}
$$

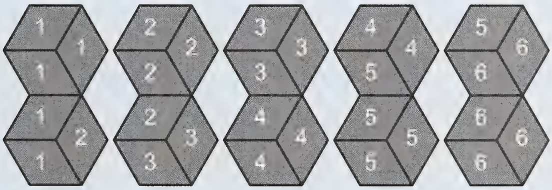
7. A green triangle represents $\frac{1}{12}$. It takes 30 green triangles to cover $2\frac{1}{2}$ double hexagons.



$$
\begin{aligned}
2\frac{1}{2} \div \frac{1}{12} &= \frac{(2 \times 2) + 1}{2} \div \frac{1}{12} \\
&= \frac{5}{2} \div \frac{1}{12} \\
&= \frac{5}{\cancel{2}_{1}} \times \frac{\cancel{12}^{6}}{1} \\
&= \frac{30}{1} \\
&= 30
\end{aligned}
$$

**4. Textbook, page 155, "Put into Practice," questions 8 to 10**

8. The number of $\frac{5}{6}$'s in 5 can be found by covering five double hexagons with blue rhombi. Then, remove the rhombi in groups of five. (Each group represents $\frac{5}{6}$.) The following diagram shows this by numbering each rhombi with its group number.




There are six groups of five rhombi covering the five double hexagons.

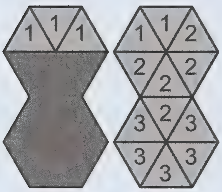
$$
\begin{aligned}
5 \div \frac{5}{6} &= \frac{5}{1} \div \frac{5}{6} \\
&= \frac{\cancel{5}^{1}}{1} \times \frac{6}{\cancel{5}_{1}} \\
&= \frac{6}{1} \\
&= 6
\end{aligned}
$$

**9.** The number of $\frac{3}{4}$'s in $1\frac{1}{2}$ can be found by covering $1\frac{1}{2}$ double hexagons with red trapezoids. Remove the trapezoids in groups of three. (Each group represents $\frac{3}{4}$.) The following diagram shows this by numbering each trapezoid with its group number.


There are two groups of three trapezoids covering the $1\frac{1}{2}$ double hexagons.

$$
\begin{aligned}
1\frac{1}{2} \div \frac{3}{4} &= \frac{(1\times 2)+1}{2} \div \frac{3}{4} \\
&= \frac{3}{2} \div \frac{3}{4} \\
&= \frac{\overset{1}{\cancel{3}}}{\underset{1}{\cancel{2}}} \times \frac{\overset{2}{\cancel{4}}}{\underset{1}{\cancel{3}}} \\
&= \frac{2}{1} \\
&= 2
\end{aligned}
$$

**10.** The number of $\frac{5}{12}$'s in $1\frac{1}{4}$ can be found by covering $1\frac{1}{4}$ double hexagons with green triangles. Remove the triangles in groups of 5. (Each group represents $\frac{5}{12}$.) The following diagram shows this by numbering each triangle with its group number.



There are three groups of five triangles covering the $1\frac{1}{4}$ double hexagons.

$$\begin{aligned}1\frac{1}{4} \div \frac{5}{12} &= \frac{(1\times 4)+1}{4} \div \frac{5}{12}\\ &= \frac{5}{4} \div \frac{5}{12}\\ &= \frac{\cancelto{1}{5}}{\cancelto{1}{4}} \times \frac{\cancelto{3}{12}}{\cancelto{1}{5}}\\ &= \frac{3}{1}\\ &= 3\end{aligned}$$

**5.** The examples in "Investigation" all show changing division to multiplication. They show taking the reciprocal of the divisor. They all show multiplying by this reciprocal. This is where the old invert-and-multiply rule came from. Switching the numerator with the denominator, inverting, and taking the reciprocal all say the same thing.

The following table shows this process step by step.

| Initial Question | Reciprocal of Divisor | Multiplication Question | Answer |
|---|---|---|---|
| $\frac{2}{3} \div \frac{4}{5}$ | $\frac{1}{\frac{4}{5}} = \frac{5}{4}$ | $\frac{2}{3} \times \frac{5}{4}$ | $\frac{\cancelto{1}{2}}{3} \times \frac{5}{\cancelto{2}{4}} = \frac{5}{6}$ |

**6. Textbook, page 157, "Put into Practice," questions 11 to 13**

**11.** To divide $\frac{3}{4}$ by $\frac{1}{3}$, use these steps. Find the reciprocal of $\frac{1}{3}$. This reciprocal is 3. Multiply $\frac{3}{4}$ by the reciprocal. The result is the same as the result of the division.

$$\begin{aligned}\frac{3}{4} \div \frac{1}{3} &= \frac{3}{4} \times \frac{3}{1}\\ &= \frac{9}{4}\end{aligned}$$

12. a. $\frac{1}{3} \div \frac{1}{2} = \frac{1}{3} \times \frac{2}{1}$

$= \frac{2}{3}$

b. $\frac{1}{2} \div \frac{1}{3} = \frac{1}{2} \times \frac{3}{1}$

$= \frac{3}{2}$ or $1\frac{1}{2}$

c. $\frac{2}{3} \div \frac{1}{2} = \frac{2}{3} \times \frac{2}{1}$

$= \frac{4}{3}$ or $1\frac{1}{3}$

d. $1\frac{1}{5} \div 1\frac{1}{2} = \frac{(1 \times 5) + 1}{5} \div \frac{(1 \times 2) + 1}{2}$

$= \frac{6}{5} \div \frac{3}{2}$

$= \frac{\overset{2}{\cancel{6}}}{5} \times \frac{2}{\underset{1}{\cancel{3}}}$

$= \frac{4}{5}$

e. $3\frac{1}{3} \div 1\frac{1}{4} = \frac{(3 \times 3) + 1}{3} \div \frac{(1 \times 4) + 1}{4}$

$= \frac{10}{3} \div \frac{5}{4}$

$= \frac{\overset{2}{\cancel{10}}}{3} \times \frac{4}{\underset{1}{\cancel{5}}}$

$= \frac{8}{3}$ or $2\frac{2}{3}$

f. $4\frac{2}{3} \div 1\frac{1}{6} = \frac{(4 \times 3) + 2}{3} \div \frac{(1 \times 6) + 1}{6}$

$= \frac{14}{3} \div \frac{7}{6}$

$= \frac{\overset{2}{\cancel{14}}}{\underset{1}{\cancel{3}}} \times \frac{\overset{2}{\cancel{6}}}{\underset{1}{\cancel{7}}}$

$= \frac{4}{1}$ or 4

g. $\frac{3}{4} \div \frac{1}{2} = \frac{3}{\underset{2}{\cancel{4}}} \times \frac{\overset{1}{\cancel{2}}}{1}$

$= \frac{3}{2}$ or $1\frac{1}{2}$

h. $\frac{5}{6} \div \frac{1}{4} = \frac{5}{\underset{3}{\cancel{6}}} \times \frac{\overset{2}{\cancel{4}}}{1}$

$= \frac{10}{3}$ or $3\frac{1}{3}$

i. $3\frac{1}{2} \div 1\frac{2}{3} = \frac{(3 \times 2) + 1}{2} \div \frac{(1 \times 3) + 2}{3}$

$= \frac{7}{2} \div \frac{5}{3}$

$= \frac{7}{2} \times \frac{3}{5}$

$= \frac{21}{10}$ or $2\frac{1}{10}$

j. $\frac{1}{10} \div \frac{1}{100} = \frac{1}{\underset{1}{\cancel{10}}} \times \frac{\overset{10}{\cancel{100}}}{1}$

$= \frac{10}{1}$ or 10

k. $0.1 \div 0.01 = \frac{1}{10} \div \frac{1}{100}$

$= \frac{1}{\underset{1}{\cancel{10}}} \times \frac{\overset{10}{\cancel{100}}}{1}$

$= \frac{10}{1}$ or 10

l. $\frac{3}{10} \div \frac{5}{1000} = \frac{3}{\underset{1}{\cancel{10}}} \times \frac{\overset{\overset{20}{\cancel{100}}}{\cancel{1000}}}{\underset{1}{\cancel{5}}}$

$= \frac{60}{1}$ or 60

m. $0.3 \div 0.005 = \frac{3}{10} \div \frac{5}{1000}$

$= \frac{3}{\underset{1}{\cancel{10}}} \times \frac{\overset{\overset{20}{\cancel{100}}}{\cancel{1000}}}{\underset{1}{\cancel{5}}}$

$= \frac{60}{1}$ or 60

n. $0.75 \div 0.5 = \frac{3}{4} \div \frac{1}{2}$

$= \frac{3}{\underset{2}{\cancel{4}}} \times \frac{\overset{1}{\cancel{2}}}{1}$

$= \frac{3}{2}$ or $1\frac{1}{2}$

**13.** Questions 12.l. and m. have the same answer. They are the same question. One uses decimal fractions. The other uses common fractions.

Questions 12.j. and k. have the same answer. They are the same question. One uses decimal fractions. The other uses common fractions.

Questions 12.g. and n. have the same answer. They are the same question. One uses decimal fractions. The other uses common fractions.

Questions 12.b. and g. (and n.) have the same answer. In each case the divisor is $1\frac{1}{2}$ times the dividend.

## Section 2: Ratios, Rates, and Percents

### Lesson 1: Ratio

**1. Textbook, page 241, "Put into Practice," questions 1 and 2**

**1. a.** 3:5 

**b.** 5:3 

**c.** 4:7 

**d.** 4:8 

2. a. $8:6$ or $4:3$  b. $7:3$  c. $2:6$ or $1:3$
d. $6:2$ or $3:1$  e. $8:26$ or $4:13$  f. $8:18$ or $4:9$

**2. Textbook, pages 242 and 243, "Put into Practice," questions 4 and 5**

**4. a.** 3 red : 1 blue : 2 green  $3:1:2$

**b.** 2 red : 3 blue : 1 yellow  $2:3:1$

**c.** 4 blue : 2 red : 2 green  $4:2:2$

**d.** 1 yellow : 2 green : 3 blue : 1 red  $1:2:3:1$

**5.** There are $5+3+4=12$ parts.

$\frac{5}{12}$ of the mixture is wheat.

$$\begin{aligned}\frac{5}{12}\times 60 &= \frac{5}{\cancel{12}_{1}}\times\frac{\cancel{60}^{5}}{1}\\ &= 5\times 5\\ &= 25\end{aligned}$$

$\frac{3}{12}$ of the mixture is oats.

$$\begin{aligned}\frac{3}{12}\times 60 &= \frac{3}{\cancel{12}_{1}}\times\frac{\cancel{60}^{5}}{1}\\ &= 3\times 5\\ &= 15\end{aligned}$$

The rest of the mixture is corn.

$$60-25-15=20$$

There are 25 kg of wheat, 15 kg of oats, and 20 kg of corn in the feed mixture.

3. Sugar dissolves in water. It doesn't add volume directly to the mixture. The new volume is less than the sum of the volumes of the sugar and water.

4. a. water : colouring : sugar $= 80 : \boxed{8} : 37$

   b. The total number of parts is $\boxed{80} + 8 + 37 = \boxed{125}$.

   $\frac{80}{125}$ or $\frac{\boxed{16}}{25}$ of the contents by mass is water.

   Divide the numerator and denominator by $\boxed{5}$.

$$\begin{aligned}\frac{16}{25} \times 750 &= \frac{16}{1} \times 30 \\ &= \boxed{480}\end{aligned}$$

   The bottle contains 480 g of water.

   $\frac{8}{125}$ is colouring.

$$\frac{8}{125} \times \boxed{750} = 48$$

   The bottle contains $\boxed{48}$ g of colouring.
   The rest of the soft drink is sugar and flavouring.
   The total water and colouring is $\left(\boxed{480} + \boxed{48}\right)$ g.
   The remaining amount is $\left(750 - \boxed{528}\right)$ g.
   The bottle contains 222 g of sugar and flavouring.

5. **Textbook, pages 246 and 247, "Investigation," questions a. and b.**

**a.** The ratio of people who enjoy their food more to the total of people number is $E : T = \boxed{5} : \boxed{6}$.

$$\frac{\text{enjoy}}{\text{total}} = \frac{5}{6}$$

$$\frac{e}{42} = \frac{\boxed{5}}{6}$$

$$42 \times \frac{e}{42} = \boxed{42} \times \frac{5}{6}$$ Multiply both sides by $\boxed{42}$.

$$1 \times \frac{e}{1} = 7 \times \frac{\boxed{5}}{1}$$

$$e = 35$$

$\boxed{35}$ people enjoy their food more.

**b.**

$$\frac{\text{enjoy}}{\text{total}} = \frac{5}{6}$$

$$\frac{200}{t} = \frac{5}{6}$$

$$\frac{t}{200} = \frac{6}{5}$$

$$\boxed{200} \times \frac{t}{200} = \boxed{200} \times \frac{6}{5}$$ Multiply both sides by $\boxed{200}$.

$$1 \times \frac{t}{1} = \boxed{40} \times \frac{6}{5}$$

$$t = 240$$

$\boxed{240}$ ex-smokers were polled.

6. **Textbook, page 247, "Put into Practice," questions 6 and 7**

6. The chef would now need 833 mL of vinegar.

$$\frac{\text{oil}}{\text{vinegar}} = \frac{3}{7}$$

$$\frac{357}{v} = \frac{3}{7}$$ Use the reciprocals to bring V to the top.

$$\frac{v}{357} = \frac{7}{3}$$

$$\overset{1}{\cancel{357}} \times \frac{v}{\underset{1}{\cancel{357}}} = \overset{119}{\cancel{357}} \times \frac{7}{\underset{1}{\cancel{3}}}$$ Multiply both sides by 357.

$$v = 119 \times 7$$

$$v = 833$$

7. **a.** The ratio of concentrate to water is $1:3$.

   **b.** The ratio of concentrate to final mixture is $1:4$.

   **c.** There were 76 mL of concentrate used.

$$\frac{\text{concentrate}}{\text{final mixture}} = \frac{1}{4}$$

$$\frac{c}{304} = \frac{1}{4}$$

$$\overset{1}{\cancel{304}} \times \frac{c}{\underset{1}{\cancel{304}}} = \overset{76}{\cancel{304}} \times \frac{1}{\underset{1}{\cancel{4}}}$$ Multiply each side by 304.

$$c = 76$$

## Lesson 2: Problem Solving with Ratios

**1. Textbook, page 249, "Investigation"**

$$\frac{\text{goals}}{\text{shots}}=\frac{3}{23}$$
$$\frac{39}{s}=\frac{3}{23}$$
$$\frac{\boxed{s}}{39}=\frac{\boxed{23}}{3}$$
$$\boxed{39}\times\frac{s}{39}=\boxed{39}\times\frac{23}{3}$$ Mutliply both sides by 39.
$$1\times\frac{s}{1}=13\times\frac{23}{1}$$
$$s=299$$

The Icemen probably had $\boxed{299}$ shots on goal.

**2. Textbook, pages 250 and 251, "Put into Practice," questions 1 to 6**

**1.** **a.** active : buffers : filler $=6:2:1$.

**b.** The sum of the parts is $6+2+1=9$.

$\frac{6}{9}$ of the 810 mg will be active ingredient.

$$\frac{6}{\cancel{9}_{1}}\times\cancel{810}^{90}=\frac{6}{1}\times 90$$
$$=540$$

There are 540 mg of active ingredient in a full bottle of tablets.

$\frac{2}{9}$ of the 810 mg will be buffers.

$$\frac{2}{\cancel{9}_{1}}\times\cancel{810}^{90}=\frac{2}{1}\times 90$$
$$=180$$

There are 180 mg of buffers in a full bottle of tablets.

$\frac{1}{9}$ of the 810 mg will be filler.

$$\frac{1}{\underset{1}{\cancel{9}}}\times \overset{90}{\cancel{810}}=\frac{1}{1}\times 90$$

$$=90$$

There are 90 mg of filler in a full bottle of tablets.

**2. a.** $6:4=\frac{6}{4}$

$=\frac{6\div 2}{4\div 2}$

$=\frac{3}{2}$ or $3:2$

Press these calculator keys.


**b.** $12:18:24=(12\div 6):(18\div 6):(24\div 6)$

$=2:3:4$

**c.** $6:9:3:12=(6\div 3):(9\div 3):(3\div 3):(12\div 3)$

$=2:3:1:4$

**d.** $140:70:280:210=(140\div 70):(70\div 70):(280\div 70):(210\div 70)$

$=2:1:4:3$

**e.** $8:2=(8\div 2):(2\div 2)$

$=4:1$

Press these calculator keys.


**f.** $10:24:16=(10\div 2):(24\div 2):(16\div 2)$

$=5:12:8$

**g.** $27:30:60=(27\div 3):(30\div 3):(60\div 3)$

$=9:10:20$

**h.** $40:30:15:10:5=(40\div 5):(30\div 5):(15\div 5):(10\div 5):(5\div 5)$

$=8:6:3:2:1$

3. Answers will vary depending on the ratio you chose.

4. Change each ratio to a fraction. Find equivalent fractions with a common denominator. The fraction with the larger numerator will come from the larger ratio.

$$5:6=\frac{5}{6} \qquad 7:9=\frac{7}{9}$$

$$\frac{5}{6}=\frac{5\times3}{6\times3} \qquad \frac{7}{9}=\frac{7\times2}{9\times2}$$

$$=\frac{15}{18} \qquad =\frac{14}{18}$$

Convert to decimal fractions. The larger decimal fraction comes from the larger ratio.

$$5:6=\frac{5}{6} \qquad 7:9=\frac{7}{9}$$

$$=0.83\overline{3} \qquad =0.7\overline{7}$$

$5:6$ is a larger ratio than $7:9$.

5. Use the decimal form of the fractions. The larger decimal fraction will come from the larger ratio.

$$\frac{3}{4}=0.75 \qquad \frac{7}{8}=0.875$$

Find equivalent fractions with common denominators. The fraction with the larger numerator will come from the larger ratio.

$$\frac{3}{4}=\frac{3\times2}{4\times2} \qquad \frac{7}{8}$$

$$=\frac{6}{8}$$

$\frac{7}{8}$ is a larger ratio than $\frac{3}{4}$.

6. Methods may vary. Sample methods are shown.

a. $1:3 = \frac{1}{3} = 0.\overline{33}$ $\quad 3:5 = \frac{3}{5} = 0.6$

$3:5$ is the larger ratio.

b. $\frac{5}{12} \doteq 0.416\overline{6}$ $\quad \frac{10}{23} \doteq 0.434\ 78$

$\frac{10}{23}$ is the larger ratio.

c. $8:11 = \frac{8}{11} = \frac{8\times 10}{11\times 10} = \frac{80}{110}$ $\quad 7:10 = \frac{7}{10} = \frac{7\times 11}{10\times 11} = \frac{77}{110}$

$8:11$ is the larger ratio.

d. $\frac{4}{5} = \frac{4\times 3}{5\times 3} = \frac{12}{15}$ $\quad \frac{2}{3} = \frac{2\times 5}{3\times 5} = \frac{10}{15}$

$\frac{4}{5}$ is the larger ratio.

e. $\frac{11}{32}$ $\quad \frac{5}{16} = \frac{5\times 2}{16\times 2} = \frac{10}{32}$

$\frac{11}{32}$ is the larger ratio.

f. $1:4 = \frac{1}{4} = 0.25$ $\quad 3:8 = \frac{3}{8} = 0.375$

$3:8$ is the larger ratio.

g. $\frac{6}{10}$ $\quad \frac{2}{5} = \frac{2\times 2}{5\times 2} = \frac{4}{10}$

$\frac{6}{10}$ is the larger ratio.

h. $\frac{14}{20} = 0.7$ $\quad \frac{7}{8} = 0.875$

$\frac{7}{8}$ is the larger ratio.

**3. Textbook, pages 253 and 254, "Put into Practice," questions 7 to 11**

7. a. copper : nickel : silver : gold : total $= 3:8:4:9:24$

**b.** The ratio of gold to copper is $9:3$.

$$\frac{\text{gold}}{\text{copper}} = \frac{9}{3}$$

$$\frac{G}{75} = \frac{9}{3}$$

Press these calculator keys.

$$\overset{1}{\cancel{75}} \times \frac{G}{\underset{1}{\cancel{75}}} = \overset{25}{\cancel{75}} \times \frac{9}{\underset{1}{\cancel{3}}}$$


$$G = 25 \times 9$$

$$G = 225$$

If there were 75 g of copper, there would be 225 g of gold.

**c.** The ratio of nickel to the total is $8:24$. The ratio of silver to the total is $4:24$.

$$\frac{\text{nickel}}{\text{total}} = \frac{8}{24}$$

$$\frac{n}{600} = \frac{8}{24}$$

Press these calculator keys.

$$\overset{1}{\cancel{600}} \times \frac{n}{\underset{1}{\cancel{600}}} = \overset{25}{\cancel{600}} \times \frac{8}{\underset{1}{\cancel{24}}}$$


$$n = 25 \times 8$$

$$n = 200$$

$$\frac{\text{silver}}{\text{total}} = \frac{4}{24}$$

$$\frac{s}{600} = \frac{4}{24}$$

Press these calculator keys.

$$\overset{1}{\cancel{600}} \times \frac{s}{\underset{1}{\cancel{600}}} = \overset{25}{\cancel{600}} \times \frac{4}{\underset{1}{\cancel{24}}}$$


$$s = 25 \times 4$$

$$s = 100$$

There would be 200 g of nickel and 100 g of silver.

**d.** The ratio of nickel to the total is $8:24$.

$$\frac{\text{nickel}}{\text{total}} = \frac{8}{24}$$

$$\frac{250}{t} = \frac{\overset{1}{\cancel{8}}}{\underset{3}{\cancel{24}}}$$

$$\frac{250}{t} = \frac{1}{3}$$

$$\frac{250}{t} = \frac{1 \times 250}{3 \times 250}$$

$$\frac{250}{t} = \frac{250}{750}$$

$$t = 750$$

The decanter had a mass of 750 g.

**8. a.** carbon dioxide : nitrogen : total $= 3:1:4$

**b.** The ratio of carbon dioxide to the total is $3:4$.

$$\frac{\text{carbon dioxide}}{\text{total}} = \frac{3}{4}$$

$$\frac{c}{380} = \frac{3}{4}$$

$$\overset{1}{\cancel{380}} \times \frac{c}{\underset{1}{\cancel{380}}} = \overset{95}{\cancel{380}} \times \frac{3}{\underset{1}{\cancel{4}}}$$

$$c = 95 \times 3$$

$$c = 285$$

Press these calculator keys.


The dispenser contained 285 g of carbon dioxide.

**c.** The dispenser contained $380 - 285 = 95$ g of nitrogen.

**9. a.** receptionists : chefs : servers : total $= 2:4:6:12$

**b.** **i.** The ratio of chefs to the total number of staff in the larger restaurant is $4:12$.

$$\frac{\text{chefs}}{\text{total}}=\frac{4}{12}$$

$$\frac{c}{96}=\frac{4}{12}$$

$$\overset{1}{\cancel{96}}\times\frac{c}{\underset{1}{\cancel{96}}}=\overset{8}{\cancel{96}}\times\frac{4}{\underset{1}{\cancel{12}}}$$

$$c=8\times4$$

$$c=32$$

Press these calculator keys.


There were 32 chefs in the larger restaurant.

**ii.** The ratio of servers to the total number of staff in the larger restaurant is $6:12$.

$$\frac{\text{servers}}{\text{total}}=\frac{6}{12}$$

$$\frac{s}{96}=\frac{6}{12}$$

$$\overset{1}{\cancel{96}}\times\frac{c}{\underset{1}{\cancel{96}}}=\overset{8}{\cancel{96}}\times\frac{6}{\underset{1}{\cancel{12}}}$$

$$c=8\times6$$

$$c=48$$

Press these calculator keys.


There were 48 servers in the larger restaurant.

**10.** **a.** cotton : rayon : nylon : total $=9:4:2:15$

**b.** The ratio of rayon to the total materials is $4:15$.

$$\frac{\text{rayon}}{\text{total}} = \frac{4}{15}$$

$$\frac{r}{75\,000} = \frac{4}{15}$$

$$\overset{1}{\cancel{75\,000}} \times \frac{r}{\underset{1}{\cancel{75\,000}}} = \overset{5000}{\cancel{75\,000}} \times \frac{4}{\underset{1}{\cancel{15}}}$$

$$r = 5000 \times 4$$

$$r = 20\,000$$

Press these calculator keys.


They used 20 000 kg of rayon.

**11. a.** The most likely ratio of F:B is $72:1$.

**b.**

$$\frac{\text{family}}{\text{total}} = \frac{72}{73}$$

$$\frac{f}{365} = \frac{72}{73}$$

$$\overset{1}{\cancel{365}} \times \frac{f}{\underset{1}{\cancel{365}}} = \overset{5}{\cancel{365}} \times \frac{72}{\underset{1}{\cancel{73}}}$$

$$f = 5 \times 72$$

$$f = 360$$

Press these calculator keys.


The boy likely ate the family dinner 360 times in the year.

## Lesson 3: Rate

**1. Textbook, page 255, "Investigation," questions a. to e.**

**a.** "The typist is typing at 80 words per minute" tells you that for each minute of typing, there will be 80 new words on the page.

**b.** "The water is flowing at 50 L/min" tells you that for each minute that passes another 50 L of water is used.

**c.** "The car is travelling at 80 km/h" tells you that in one hour the car will have gone 80 km.

**d.** "The heart is beating at 78 beats per minute" tells you that in one minute there will have been 78 heart beats.

**e.** "The gold has a density of 19.3 $\text{g/cm}^3$" tells you that 1 $\text{cm}^3$ of gold weighs 19.3 g.

**2. a. Textbook, pages 258 and 259, "Put into Practice," questions 1.a. to e., 2.a. and b., 3, 4, 5, and 6.a. to e.**

**1. a.** $\text{rate} = \dfrac{105 \text{ km}}{1.75 \text{ h}} = \dfrac{(105 \div 1.75) \text{ km}}{(1.75 \div 1.75) \text{ h}} = \dfrac{60 \text{ km}}{1 \text{ h}}$ or 60 km/h

**b.** $\text{rate} = \dfrac{20 \text{ recipes}}{5 \text{ people}} = \dfrac{(20 \div 5) \text{ recipes}}{(5 \div 5) \text{ people}} = \dfrac{4 \text{ recipes}}{1 \text{ person}}$ or 4 recipes per person

**c.** $\text{rate} = \dfrac{960 \text{ recipes}}{120 \text{ tables}} = \dfrac{(960 \div 120) \text{ people}}{(120 \div 120) \text{ tables}} = \dfrac{8 \text{ people}}{1 \text{ table}}$ or 8 people per table

**d.** $\text{rate} = \dfrac{1260 \text{ pages}}{9 \text{ books}} = \dfrac{(1260 \div 9) \text{ pages}}{(9 \div 9) \text{ books}} = \dfrac{140 \text{ pages}}{1 \text{ book}}$ or 140 pages per book

**e.** $\text{rate} = \dfrac{144 \text{ bags}}{12 \text{ boxes}} = \dfrac{(144 \div 12) \text{ bags}}{(12 \div 12) \text{ boxes}} = \dfrac{12 \text{ bags}}{1 \text{ box}}$ or 12 bags of potato chips per box

**2. a.** The answers are shown in the table. Calculations follow the table.

| Words Typed | $a = 125$ | 250 | 375 | $c = 1000$ |
|---|---|---|---|---|
| Minutes | 1 | 2 | $b = 3$ | 8 |

$$\frac{a}{1} = \frac{250}{2}$$
$$= \frac{250 \div 2}{2 \div 2}$$
$$= \frac{125}{1}$$

$$\frac{375}{b} = \frac{125}{1}$$
$$\frac{b}{375} = \frac{1}{125}$$
$$\cancel{375}^{1} \times \frac{b}{\cancel{375}_{1}} = \cancel{375}^{3} \times \frac{1}{\cancel{125}_{1}}$$
$$b = 3$$

$$\frac{c}{8} = \frac{125}{1}$$
$$\cancel{8}^{1} \times \frac{c}{\cancel{8}_{1}} = 8 \times \frac{125}{1}$$
$$c = 1000$$

**b.**

| Fuel Used (L) | 12.2 | 36.6 | $e = 244$ | 61 |
|---|---|---|---|---|
| Time (h) | 1 | $d = 3$ | 20 | $f = 5$ |

$$\frac{12.2}{1} = \frac{36.6}{d}$$
$$\frac{1}{12.2} = \frac{d}{36.6}$$
$$\cancel{36.6}^{3} \times \frac{1}{\cancel{12.2}_{1}} = \cancel{36.6}^{1} \times \frac{d}{\cancel{36.6}_{1}}$$
$$3 = d$$

$$\frac{e}{20} = \frac{12.2}{1}$$
$$\cancel{20}^{1} \times \frac{e}{\cancel{20}_{1}} = 20 \times \frac{12.2}{1}$$
$$e = 244$$

$$\frac{12.2}{1} = \frac{61}{f}$$
$$\frac{1}{12.2} = \frac{f}{61}$$
$$\cancel{61}^{5} \times \frac{1}{\cancel{12.2}_{1}} = \cancel{61}^{1} \times \frac{f}{\cancel{61}_{1}}$$
$$5 = f$$

3. First change minutes to hours. Then find the rate. 175 min is $\frac{175}{60} = \frac{35}{12}$ h.

$$\begin{aligned} \text{rate} &= 35 \div \frac{35}{12} \\ &= \frac{\overset{1}{\cancel{35}}}{1} \times \frac{12}{\underset{1}{\cancel{35}}} \\ &= 12 \end{aligned}$$

The chef makes pizzas at 12 pizzas per hour.

$$\frac{12 \text{ pizzas}}{1 \text{ h}} \times 4 \text{ h} = 48 \text{ pizzas}$$

The chef could make 48 pizzas in 4 h.

4. **a.** $\$45/\text{h} \times 32.5 \text{ h} = \$1462.50$

David earned $1462.50 last week.

**b.** $$\begin{aligned} \text{rate} &= \frac{\$2209.88}{41.5 \text{ h}} \\ &\doteq \$53.25/\text{h} \end{aligned}$$

His rate of pay would be $53.25/h.

5. **a.** $$\begin{aligned} \text{rate} &= \frac{35 \text{ blocks}}{14 \text{ min}} \\ &= \frac{2.5 \text{ blocks}}{1 \text{ min}} \end{aligned}$$

Janush walked 2.5 blocks/min.

**b.** First change hours to minutes. 2.5 h is 150 min. Then apply the rate.

$$\frac{2.5 \text{ blocks}}{1 \text{ min}} \times 150 \text{ min} = 375 \text{ blocks}$$

She could walk 375 blocks in 2.5 h.

6. a. $\text{rate} = \dfrac{\$14.96}{4 \text{ meals}}$

$= \dfrac{\$(14.96 \div 4)}{(4 \div 4) \text{ meals}}$

$= \dfrac{\$3.74}{1 \text{ meal}}$

The unit rate is \$3.74 per mini meal.

b. $\text{rate} = \dfrac{\$3.92}{8 \text{ drinks}}$

$= \dfrac{\$(3.92 \div 8)}{(8 \div 8) \text{ drinks}}$

$= \dfrac{\$0.49}{1 \text{ drink}}$

The unit rate is \$0.49 per soft drink.

c. $\text{rate} = \dfrac{\$426.00}{40 \text{ h}}$

$= \dfrac{\$(426.00 \div 40)}{(40 \div 40) \text{ h}}$

$= \dfrac{\$10.65}{1 \text{ h}}$

The unit rate for fruit packers is \$10.65/h.

d. $\text{rate} = \dfrac{\$2.88}{2 \text{ dozen}}$

$= \dfrac{(\$2.88 \div 2)}{(2 \div 2) \text{ dozen}}$

$= \dfrac{\$1.44}{1 \text{ dozen}}$

The unit rate is \$1.44 per dozen cookies.

OR

$\text{rate} = \dfrac{\$2.88}{2 \text{ dozen}}$

$= \dfrac{\$2.88}{24 \text{ cookies}}$

$= \dfrac{\$(2.88 \div 24)}{(24 \div 24) \text{ cookies}}$

$= \dfrac{\$0.12}{1 \text{ cookie}}$

The unit rate is \$0.12 per cookie.

b. **Textbook, pages 258 and 259, "Put into Practice," questions 1.f. to h., 2.c. and d., and 6.e. to g.**

**1. f.** $\text{rate} = \dfrac{312 \text{ eggs}}{39 \text{ cartons}}$

$= \dfrac{(312 \div 39) \text{ eggs}}{(39 \div 39) \text{ cartons}}$

$= \dfrac{8 \text{ eggs}}{1 \text{ carton}}$ or 8 eggs per carton

**g.** $\text{rate} = \dfrac{111 \text{ students}}{3 \text{ classes}}$

$= \dfrac{(111 \div 3) \text{ students}}{(3 \div 3) \text{ classes}}$

$= \dfrac{37 \text{ students}}{1 \text{ class}}$ or 37 students per classroom

**h.** $\text{rate} = \dfrac{52 \text{ L}}{4 \text{ containers}}$

$= \dfrac{(52 \div 4) \text{ L}}{(4 \div 4) \text{ containers}}$

$= \dfrac{13 \text{ L}}{1 \text{ container}}$ or 13 L of ice cream per container

2. c. The answers are shown in the table. The calculations follow the table.

| **Tables** | $g=1$ | 2 | 5 | $i=33$ |
|---|---|---|---|---|
| **Chairs** | 8 | 16 | $h=40$ | 264 |

$$\frac{g}{8}=\frac{2}{16}$$

$$\cancel{8}^{1}\times\frac{g}{\cancel{8}_{1}}=\cancel{8}^{1}\times\frac{\cancel{2}^{1}}{\cancel{16}_{\cancel{2}_{1}}}$$

$$g=1$$

$$\frac{5}{h}=\frac{1}{8}$$

$$\frac{h}{5}=\frac{8}{1}$$

$$\cancel{5}^{1}\times\frac{h}{\cancel{5}_{1}}=5\times\frac{8}{1}$$

$$h=40$$

$$\frac{i}{264}=\frac{1}{8}$$

$$\cancel{264}^{1}\times\frac{i}{\cancel{264}_{1}}=\cancel{264}^{33}\times\frac{1}{\cancel{8}_{1}}$$

$$i=33$$

d.

| **Glasses** | $j=1$ | 2 | 5 | $m=15$ |
|---|---|---|---|---|
| **Volume (mL)** | 180 | 360 | $k=900$ | 2700 |

$$\frac{j}{180}=\frac{2}{360}$$

$$\cancel{180}^{1}\times\frac{j}{\cancel{180}_{1}}=\cancel{180}^{1}\times\frac{\cancel{2}^{1}}{\cancel{360}_{\cancel{2}_{1}}}$$

$$j=1$$

$$\frac{5}{k}=\frac{1}{180}$$

$$\frac{k}{5}=\frac{180}{1}$$

$$\cancel{5}^{1}\times\frac{k}{\cancel{5}_{1}}=5\times\frac{180}{1}$$

$$k=900$$

$$\frac{m}{2700}=\frac{1}{180}$$

$$\cancel{2700}^{1}\times\frac{m}{\cancel{2700}_{1}}=\cancel{2700}^{15}\times\frac{1}{\cancel{180}_{1}}$$

$$m=15$$

6. e. $\text{rate} = \frac{400 \text{ words}}{80 \text{ cakes}}$

$= \frac{(400 \div 80) \text{ words}}{(80 \div 80) \text{ cakes}}$

$= \frac{5 \text{ words}}{1 \text{ cake}}$

The unit rate is 5 words per cake.

f. $\text{rate} = \frac{48 \text{ burgers}}{16 \text{ players}}$

$= \frac{(48 \div 16) \text{ burgers}}{(16 \div 16) \text{ players}}$

$= \frac{3 \text{ burgers}}{1 \text{ player}}$

The unit rate is 3 burgers per player.

g. $\text{rate} = \frac{512 \text{ cookies}}{32 \text{ trays}}$

$= \frac{(512 \div 32) \text{ cookies}}{(32 \div 32) \text{ trays}}$

$= \frac{16 \text{ cookies}}{1 \text{ tray}}$

The unit rate is 16 cookies per tray.

3. a. **Textbook, page 260, "Put into Practice," questions 7 and 8**

7. a. $\text{rate} = \frac{28 \text{ pies}}{14 \text{ h}}$

$= \frac{(28 \div 14) \text{ cookies}}{(14 \div 14) \text{ h}}$

$= \frac{2 \text{ pies}}{1 \text{ h}}$

Stefan baked 2 pies/h.

b. $$\frac{2\text{ pies}}{1\text{ h}}\times 74\text{ h}=\frac{2\text{ pies}}{\cancel{1\text{ h}}_{1}}\times 74\ \cancel{\text{h}}^{1}$$
$$=2\times 74\text{ pies}$$
$$=148\text{ pies}$$

Stefan would bake 148 pies in 74 h.

8. Find the unit cost of each type of chocolate.

**Chocolate Rabbit**

$$\frac{c¢}{1\text{ g}}=\frac{1247¢}{450\text{ g}}$$
$$=\frac{(1247\div 450)¢}{(450\div 450)\text{ g}}$$
$$\doteq\frac{2.771111111¢}{1\text{ g}}$$

The cost per gram is about 2.77¢.

**Chocolate Bar**

$$\frac{c¢}{1\text{ g}}=\frac{125¢}{35\text{ g}}$$
$$=\frac{(125\div 35)¢}{(35\div 35)\text{ g}}$$
$$\doteq\frac{3.571\,428\,571¢}{1\text{ g}}$$

The cost per gram is about 3.57¢.

The chocolate rabbit is the better buy. It costs less per gram than the chocolate bar.

**b. Textbook, pages 379 to 382, "Put into Practice," questions 1, 8, and 9**

1. The large burger and fries costs $\$2.99+\$1.99=\$4.98$. You should not buy the combo because it will cost you $1.01 more.

8. a. **Zaba's Price for 1 Quick Dinner**

$0.59

**Anecca's Price for 1 Quick Dinner**

$$\frac{\$7.99}{12}=\frac{x}{1}$$
$$\$0.665\,8\overline{3}=x$$
$$\$0.67\doteq x$$

Zaba's has the best price on Quick Dinner.

**b. Zaba's Price for Chips**

$$2 \times 400\text{ g} = 800\text{ g cost } \$5.00$$

$$\frac{\$5.00}{800\text{ g}} = \frac{x}{100\text{ g}}$$

$$\cancel{100\text{ g}}^{1} \times \frac{\$5.00}{\cancel{800\text{ g}}_{8}} = \cancel{100\text{ g}}^{1} \times \frac{x}{\cancel{100\text{ g}}_{1}}$$

$$\$0.625 = x$$

100 g cost about \$0.63.

**Anecca's Price for Chips**

$$3 \times 180\text{ g} = 540\text{ g cost } \$3.99$$

$$\frac{\$3.99}{540\text{ g}} = \frac{x}{100\text{ g}}$$

$$\cancel{100\text{ g}}^{5} \times \frac{\$3.99}{\cancel{540\text{ g}}_{27}} = \cancel{100\text{ g}}^{1} \times \frac{x}{\cancel{100\text{ g}}_{1}}$$

$$\frac{5 \times \$3.99}{27} = x$$

$$\$0.73\overline{8} = x$$

100 g cost about \$0.74.

**9.**

**Toothpaste A**

$$2 \times 130\text{ mL} = 260\text{ mL}$$

$$\frac{x}{100\text{ mL}} = \frac{300¢}{260\text{ mL}}$$

$$\cancel{100\text{ mL}}^{1} \times \frac{x}{\cancel{100\text{ mL}}_{1}} = \cancel{100\text{ mL}}^{5} \times \frac{300¢}{\cancel{260\text{ mL}}_{13}}$$

$$x = \frac{5 \times 300¢}{13}$$

$$x \doteq 115¢$$

OR

$$\frac{x}{100\text{ mL}} = \frac{\$3.00}{260\text{ mL}}$$

$$\cancel{100\text{ mL}}^{1} \times \frac{x}{\cancel{100\text{ mL}}_{1}} = \cancel{100\text{ mL}}^{5} \times \frac{\$3.00}{\cancel{260\text{ mL}}_{13}}$$

$$x = \frac{5 \times \$3.00}{13}$$

$$x \doteq \$1.15$$

**Toothpaste B**

$$3 \times 75\text{ mL} = 225\text{ mL}$$

$$\frac{x}{100\text{ mL}} = \frac{399¢}{225\text{ mL}}$$

$$\cancel{100\text{ mL}}^{1} \times \frac{x}{\cancel{100\text{ mL}}_{1}} = \cancel{100\text{ mL}}^{4} \times \frac{399¢}{\cancel{225\text{ mL}}_{9}}$$

$$x = \frac{4 \times 399¢}{9}$$

$$x \doteq 177¢$$

OR

$$\frac{x}{100\text{ mL}} = \frac{\$3.99}{225\text{ mL}}$$

$$\cancel{100\text{ mL}}^{1} \times \frac{x}{\cancel{100\text{ mL}}_{1}} = \cancel{100\text{ mL}}^{4} \times \frac{\$3.99}{\cancel{225\text{ mL}}_{9}}$$

$$x = \frac{4 \times \$3.99}{9}$$

$$x \doteq \$1.77$$

100 mL of Toothpaste A costs \$1.15. 100 mL of Toothpaste B costs \$1.77.

## Lesson 4: Percent

1. **Textbook, page 261, "Investigation," questions a. to e.**

   **a.** "There is a 20% chance of rain today" means that about $\frac{1}{5}$ of the time there will be rain.

   **b.** "The bank rate is $8\frac{1}{2}\%$" means that you will pay the bank \$8.50 for every \$100 they loan you for a year.

   **c.** "The shopkeeper marked up the price by 15%" means the price you pay will be higher by 15¢ for each dollar that the item cost the shopkeeper.

   **d.** "One serving of breakfast cereal contains 28% of your daily requirement of iron" means that this cereal will give you a little more than one quarter of the iron you need each day.

   **e.** "9.86% of the population of Canada lives in Alberta" means that about one in ten Canadians is a resident of Alberta.

2. **Textbook, pages 262 and 263, "Put into Practice," questions 1 and 2**

   **1. a.** $57\% = \frac{57}{100}$

   **b.** $$\begin{aligned} 80\% &= \frac{80}{100} \\ &= \frac{80 \div 20}{100 \div 20} \\ &= \frac{4}{5} \end{aligned}$$

   **c.** $$\begin{aligned} 25\% &= \frac{25}{100} \\ &= \frac{25 \div 25}{100 \div 25} \\ &= \frac{1}{4} \end{aligned}$$

   **d.** $39\% = \frac{39}{100}$

   **2. a.** $$\begin{aligned} 47:100 &= \frac{47}{100} \\ &= 47\% \end{aligned}$$

   **b.** $\frac{23}{100} = 23\%$

c. $\dfrac{225}{100} = 225\%$

d. $43:50 = \dfrac{43}{50}$

$= \dfrac{43 \times 2}{50 \times 2}$

$= \dfrac{86}{100}$

$= 86\%$

e. $7:10 = \dfrac{7}{10}$

$= \dfrac{7 \times 10}{10 \times 10}$

$= \dfrac{70}{100}$

$= 70\%$

f. $\dfrac{6}{5} = \dfrac{6 \times 20}{5 \times 20}$

$= \dfrac{120}{100}$

$= 120\%$

**3. a. Textbook, pages 266 and 267, "Put into Practice," questions 3.a., b., f., and g.; 4.a., b., f., and i.; 5.; and 6.a. to c.**

**3. a.** $12\% = \dfrac{12}{100}$

$= \dfrac{12 \div 4}{100 \div 4}$

$= \dfrac{3}{25}$

**b.** $3.2\% = \dfrac{3.2}{100}$

$= \dfrac{3.2 \times 10}{100 \times 10}$

$= \dfrac{32}{1000}$

$= \dfrac{32 \div 8}{1000 \div 8}$

$= \dfrac{4}{125}$

**f.** $\dfrac{3}{4}\% = \dfrac{\frac{3}{4}}{100}$

$= \dfrac{\frac{3}{4} \times 4}{100 \times 4}$

$= \dfrac{3}{400}$

**g.** $0.6\% = \dfrac{0.6}{100}$

$= \dfrac{0.6 \times 10}{100 \times 10}$

$= \dfrac{6}{1000}$

$= \dfrac{6 \div 2}{1000 \div 2}$

$= \dfrac{3}{500}$

4\. **a.** $57:100 = \frac{57}{100}$

$= 57\%$

**b.** $25:50 = \frac{25}{50}$

$= \frac{25 \times 2}{50 \times 2}$

$= \frac{50}{100}$

$= 50\%$

**f.** $8:10 = \frac{8}{10}$

$= \frac{8 \times 10}{10 \times 10}$

$= \frac{80}{100}$

$= 80\%$

**i.** $24.3:1 = \frac{24.3}{1}$

$= \frac{24.3 \times 100}{1 \times 100}$

$= \frac{2430}{100}$

$= 2430\%$

5\.

| | Fraction | Decimal | Percent |
|---|---|---|---|
| **a.** | $\frac{3}{5}$ | $0.6 = 0.60$ | 60% |
| **b.** | $\frac{1}{8}$ | 0.125 | 12.5% |
| **c.** | $3\frac{9}{20} = \frac{69}{20}$ | 3.45 | 345% |
| **d.** | $6\frac{1}{4} = \frac{25}{4}$ | 6.25 | 625% |

6\. **a.** $63\% = \frac{63}{100}$

$= 0.63$

**b.** $\frac{3}{5} = \frac{3 \times 20}{5 \times 20}$

$= \frac{60}{100}$

$= 0.60$

**c.** $4\frac{1}{2} = \frac{9}{2}$

$= \frac{9 \times 50}{2 \times 50}$

$= \frac{450}{100}$

$= 4.50$

b. **Textbook, pages 266 and 267, "Put into Practice," questions 3.c., d., e., and h.; 4.c., d., g., and h.; and 6.d. to f.**

3. c. $10\% = \dfrac{10}{100}$

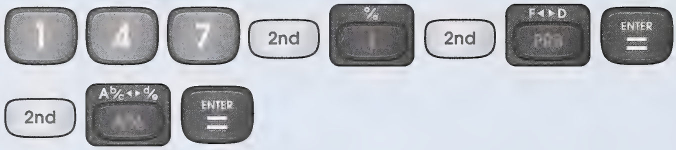
$= \dfrac{10 \div 10}{100 \div 10}$

$= \dfrac{1}{10}$

Press these calculator keys.


d. $147\% = \dfrac{147}{100}$

Press these calculator keys.

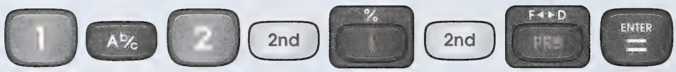



e. $\dfrac{1}{2}\% = \dfrac{\frac{1}{2}}{100}$

$= \dfrac{\frac{1}{2} \times 2}{100 \times 2}$

$= \dfrac{1}{200}$

Press these calculator keys.

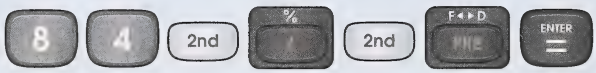



h. $84\% = \dfrac{84}{100}$

$= \dfrac{84 \div 4}{100 \div 4}$

$= \dfrac{21}{25}$

Press these calculator keys.



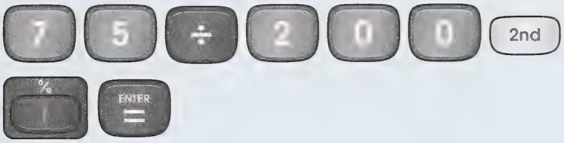
**4. c.** $75:200 = \dfrac{75}{200}$

$= \dfrac{75 \div 2}{200 \div 2}$

$= \dfrac{37.5}{100}$

$= 37.5\%$

Press these calculator keys.




**d.** $60:75 = \dfrac{60}{75}$

$= \dfrac{60 \div 0.75}{75 \div 0.75}$

$= \dfrac{80}{100}$

$= 80\%$

Press these calculator keys.


**g.** $650:1250 = \dfrac{650}{1250}$

$= \dfrac{650 \div 12.5}{1250 \div 12.5}$

$= \dfrac{52}{100}$

$= 52\%$

Press these calculator keys.


**h.** $19:19 = \dfrac{19}{19}$

$= \dfrac{19 \div 0.19}{19 \div 0.19}$

$= \dfrac{100}{100}$

$= 100\%$

Press these calculator keys.

6. **d.** $93.2\% = \dfrac{93.2}{100}$

$= \dfrac{93.2 \times 10}{100 \times 10}$

$= \dfrac{932}{1000}$

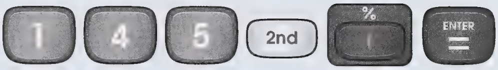
$= 0.932$

Press these calculator keys.


**e.** $145\% = \dfrac{145}{100}$

$= 1.45$

Press these calculator keys.




**f.** $\dfrac{7}{8} = \dfrac{7 \times 125}{8 \times 125}$

$= \dfrac{875}{1000}$

$= 0.875$

Press these calculator keys.


or


c. **Textbook, pages 266 and 267, "Put into Practice," questions 3.i. to l.; 4.e., j., k., and l.; and 6.g. to j.**

3. **i.** $63.5\% = \dfrac{63.5}{100}$

$= \dfrac{63.5 \div 0.5}{100 \div 0.5}$

$= \dfrac{127}{200}$

**j.** $92.5\% = \dfrac{92.5}{100}$

$= \dfrac{92.5 \div 2.5}{100 \div 2.5}$

$= \dfrac{37}{40}$

**k.** $92\dfrac{1}{2}\% = 92.5\%$

$= \dfrac{92.5}{100}$

$= \dfrac{92.5 \div 2.5}{100 \div 2.5}$

$= \dfrac{37}{40}$

**l.** $1\% = \dfrac{1}{100}$

**4. e.** $9:12 = \frac{9}{12}$

$= \frac{9 \div 0.12}{12 \div 0.12}$

$= \frac{75}{100}$

$= 75\%$

**j.** $8.45:13 = \frac{8.45}{13}$

$= \frac{8.45 \div 0.13}{13 \div 0.13}$

$= \frac{65}{100}$

$= 65\%$

**k.** $1.9:1.9 = \frac{1.9}{1.9}$

$= \frac{1.9 \div 0.019}{1.9 \div 0.019}$

$= \frac{100}{100}$

$= 100\%$

**l.** $0.12:0.12 = \frac{0.12}{0.12}$

$= \frac{0.12 \div 0.0012}{0.12 \div 0.0012}$

$= \frac{100}{100}$

$= 100\%$

**6. g.** $\frac{6}{8} = \frac{6 \times 12.5}{8 \times 12.5}$

$= \frac{75}{100}$

$= 0.75$

**h.** $\frac{3}{16} = \frac{3 \times 625}{16 \times 625}$

$= \frac{1875}{10\,000}$

$= 0.1875$

**i.** $45\% = \frac{45}{100}$

$= 0.45$

**j.** $12.3\% = \frac{12.3}{100}$

$= \frac{12.3 \times 10}{100 \times 10}$

$= \frac{123}{1000}$

$= 0.123$

4. **Textbook, page 270, "Put into Practice," questions 7 to 9**

**7. a.**

$$14\% = \frac{14}{100}$$

$$\frac{14}{100} \text{ of } 250 = \frac{14}{100} \times 250$$
$$= \frac{3500}{100}$$
$$= 35$$

**b.**

$$19\% = \frac{19}{100}$$

$$\frac{19}{100} \text{ of } 20 = \frac{19}{100} \times 20$$
$$= \frac{380}{100}$$
$$= 3.8$$

**c.**

$$108\% = \frac{108}{100}$$

$$\frac{108}{100} \text{ of } 150 = \frac{108}{100} \times 150$$
$$= \frac{16\,200}{100}$$
$$= 162$$

**d.**

$$6\% = \frac{6}{100}$$

$$\frac{6}{100} \text{ of } 18 = \frac{6}{100} \times 18$$
$$= \frac{108}{100}$$
$$= 1.08$$

**8. a.** $\frac{50}{100} = 50\%$

**b.**

$$\frac{9}{15} = \frac{9 \div 0.15}{15 \div 0.15}$$
$$= \frac{60}{100}$$
$$= 60\%$$

**c.**

$$\frac{18}{25} = \frac{18 \times 4}{25 \times 4}$$
$$= \frac{72}{100}$$
$$= 72\%$$

**d.**

$$\frac{70}{35} = \frac{70 \div 0.35}{35 \div 0.35}$$
$$= \frac{200}{100}$$
$$= 200\%$$

9. a. 50% of 50 is 25.

$$50\% = \frac{50}{100} = \frac{50 \div 50}{100 \div 50} = \frac{1}{2}$$

$$\frac{1}{2} \times x = 25$$

$$\cancel{2}^{1} \times \frac{1}{\cancel{2}_{1}} \times x = 2 \times 25$$

$$x = 50$$

b. 200% of 3 is 6.

$$200\% = \frac{200}{100} = \frac{200 \div 100}{100 \div 100} = 2$$

$$2 \times x = 6$$

$$\frac{\cancel{2}^{1} \times x}{\cancel{2}_{1}} = \frac{\cancel{6}^{3}}{\cancel{2}_{1}}$$

$$x = 3$$

c. 75% of 12 is 9.

$$75\% = \frac{75}{100} = \frac{75 \div 25}{100 \div 25} = \frac{3}{4}$$

$$\frac{3}{4} \times x = 9$$

$$\frac{\cancel{4}^{1}}{\cancel{3}_{1}} \times \frac{\cancel{3}^{1}}{\cancel{4}_{1}} \times x = \frac{4}{\cancel{3}_{1}} \times \cancel{9}^{3}$$

$$x = 4 \times 3$$

$$x = 12$$

## Lesson 5: Problems Using Percent

**1. Textbook, page 273, "Put into Practice," questions 1 to 3**

1. a. 12% of \$50 is \$6.

$$12\% \text{ of } \$50 = \frac{\cancel{12}^{6}}{\cancel{100}_{\cancel{2}_{1}}} \times \$\cancel{50}^{1} = \frac{6 \times \$1}{1} = \$6$$

b. 25% of 250 L of milk is 62.5 L of milk

$$25\% \text{ of } 250 \text{ L} = \frac{25}{\cancel{100}_{2}} \times \cancel{250}^{5} \text{ L} = \frac{25 \times 5 \text{ L}}{2} = 62\frac{1}{2} \text{ L}$$

**c.** 18% of 60 g of cheese is 10.8 g.

$$18\% \text{ of } 60 \text{ g} = \frac{18}{\cancel{100}_{5}} \times \cancel{60}^{3} \text{ g}$$
$$= \frac{18 \times 3 \text{ g}}{5}$$
$$= \frac{54}{5} \text{ g}$$
$$= 10.8 \text{ g}$$

**d.** 10% of 70 frozen dinners is 7 dinners.

$$10\% \text{ of } 70 \text{ dinners} = \frac{\cancel{10}^{1}}{\cancel{100}_{\cancel{10}_{1}}} \times \cancel{70}^{7} \text{ dinners}$$
$$= \frac{1 \times 7 \text{ dinners}}{1}$$
$$= 7 \text{ dinners}$$

**2. a.** 300 calories is 15% of 2000 calories.

$$\frac{300}{2000} = \frac{300 \div 20}{2000 \div 20}$$
$$= \frac{15}{100}$$
$$= 15\%$$

**b.** 250 calories is 12.5% of 2000 calories.

$$\frac{250}{2000} = \frac{250 \div 20}{2000 \div 20}$$
$$= \frac{12.5}{100}$$
$$= 12.5\%$$

**c.** 500 calories is 25% of 2000 calories.

$$\frac{500}{2000} = \frac{500 \div 20}{2000 \div 20}$$
$$= \frac{25}{100}$$
$$= 25\%$$

**d.** 400 calories is 20% of 2000 calories.

$$\frac{400}{2000} = \frac{400 \div 20}{2000 \div 20}$$
$$= \frac{20}{100}$$
$$= 20\%$$

**3. a. i.** $4\% \text{ of } 960 \text{ m}^3 = \frac{4}{\cancel{100}_{5}} \times \cancel{960}^{48} \text{ m}^3$

$$= \frac{4 \times 48}{5} \text{ m}^3$$
$$= \frac{192}{5} \text{ m}^3$$
$$= 38.4 \text{ m}^3$$

The room contains 38.4 $\text{m}^3$ of pure oxygen.

ii. The room contains 259.2 $m^3$ of pure nitrogen.

$$\begin{aligned}27\% \text{ of } 960\ m^3 &= \frac{27}{\cancelto{5}{100}} \times \cancelto{48}{960}\ m^3\\ &= \frac{27 \times 48}{5}\ m^3\\ &= \frac{1296}{5}\ m^3\\ &= 259.2\ m^3\end{aligned}$$

**b.** The room contains 10.6% of carbon dioxide.

$$\begin{aligned}\frac{53\ \cancel{m^3}}{500\ \cancel{m^3}} &= \frac{53 \div 5}{500 \div 5}\\ &= \frac{10.6}{100}\\ &= 10.6\%\end{aligned}$$

**2. a. Textbook, pages 274 to 277, "Put into Practice," questions 4 to 7 and 10 and 11**

**4. a.** The normal charge would be \$157.50.

$$\begin{aligned}350\% \text{ of } \$45 &= \frac{\cancelto{35}{350}}{\cancelto{2}{\cancel{20}\ \cancel{100}}} \times \$\cancelto{9}{45}\\ &= \frac{35 \times \$9}{2}\\ &= \frac{\$315}{2}\\ &= \$157.5\end{aligned}$$

**b.** The discount is \$47.25.

$$\begin{aligned}30\% \text{ of } \$157.50 &= \frac{\cancelto{3}{30}}{\cancelto{1}{\cancel{10}\ \cancel{100}}} \times \$\cancelto{15.75}{157.50}\\ &= \frac{3 \times \$15.75}{1}\\ &= \$47.25\end{aligned}$$

**c.** She will charge the group $110.25.

$$\$157.50 - \$47.25 = \$110.25$$

**5.** The tax will be $6.75.

$$\begin{aligned}15\% \text{ of } \$44.99 &= \frac{\overset{3}{\cancel{15}}}{\underset{20}{\cancel{100}}} \times \$44.99 \\ &= \frac{3 \times \$44.99}{20} \\ &= \$6.7485\end{aligned}$$

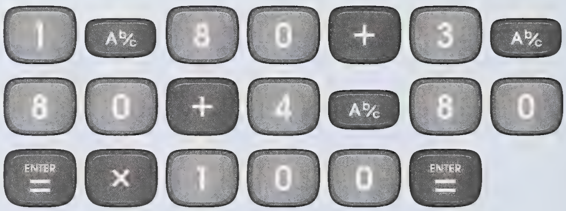
**6.** There will be 80 sections of 5 cm each in the 4-m sub.

$$\begin{aligned}4\ \text{m} \div 5\ \text{cm} &= \left(4\ \overset{1}{\cancel{\text{m}}} \times \frac{100\ \text{cm}}{1\ \underset{1}{\cancel{\text{m}}}}\right) \div 5\ \text{cm} \\ &= 400\ \text{cm} \div 5\ \text{cm} \\ &= 80\end{aligned}$$

**a.** They bought $10\%$ of the sub.

$$\begin{aligned}\frac{1}{80} + \frac{3}{80} + \frac{4}{80} &= \frac{8}{80} \\ &= \frac{8 \div 0.8}{80 \div 0.8} \\ &= \frac{10}{100} \\ &= 10\%\end{aligned}$$

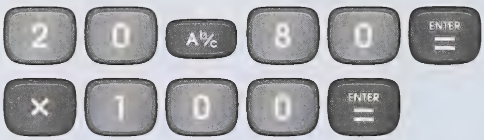
Press these calculator keys.




**b.** This teacher bought $25\%$ of the sandwich. It cost her $25.00.

$$\begin{aligned}\frac{20}{80} &= \frac{20 \div 0.8}{80 \div 0.8} \\ &= \frac{25}{100} \\ &= 25\%\end{aligned}$$

Press these calculator keys.




$$20 \times \$1.25 = \$25.00$$

**c.** There will be 33.75% left after the principal's purchase.

$$\frac{80}{80}-\left(\frac{8}{80}+\frac{20}{80}+\frac{25}{80}\right)=\frac{80}{80}-\frac{53}{80}$$
$$=\frac{80-53}{80}$$
$$=\frac{27\div 0.8}{80\div 0.8}$$
$$=\frac{33.75}{100}$$
$$=33.75\%$$

Press these calculator keys.


**d.** The ratio of sold to unsold portions is $53:27$.

**e.** If the whole sub is sold, \$100.00 will be collected.

$$80\times \$1.25=\$100.00$$

7. **a.** A new oven would cost \$4590.

$$\begin{aligned} 20\% \text{ more than } \$3825 &= \$3825 + 20\% \text{ of } \$3825 \\ &= \$3825 + \left(\frac{\overset{1}{\cancel{20}}}{\underset{\underset{1}{\cancel{5}}}{\cancel{100}}} \times \$\overset{765}{\cancel{3825}}\right) \\ &= \$3825 + \$765 \\ &= \$4590 \end{aligned}$$

**b.** Tony will need to make a down payment of \$2754 on a new oven.

$$\begin{aligned} 60\% \text{ of } \$4590 &= \frac{\overset{6}{\cancel{60}}}{\underset{\underset{1}{\cancel{10}}}{\cancel{100}}} \times \$\overset{459}{\cancel{4590}} \\ &= \frac{6 \times \$459}{1} \\ &= \$2754 \end{aligned}$$

10. **a.** The building would be 50 ft wide.

$$\begin{aligned} A &= \ell \times w \\ 5000 &= 100 \times w \\ \frac{\overset{50}{\cancel{5000}}}{\underset{1}{\cancel{100}}} &= \frac{\overset{1}{\cancel{100}} \times w}{\underset{1}{\cancel{100}}} \\ 50 &= w \end{aligned}$$

**b.** The area of the kitchen is 2700 $\text{ft}^2$.

$$\begin{aligned} 54\% \text{ of } 5000 &= \frac{54}{\underset{1}{\cancel{100}}} \times \overset{50}{\cancel{5000}} \\ &= 54 \times 50 \\ &= 2700 \end{aligned}$$

**c.** The area of cold storage space is 1600 $\text{ft}^2$.

$$\begin{aligned} 32\% \text{ of } 5000 &= \frac{32}{\cancel{100}_{1}} \times \cancel{5000}^{50} \\ &= 32 \times 50 \\ &= 1600 \end{aligned}$$

**d.** The washrooms are each 125 $\text{ft}^2$.

$$\begin{aligned} 5\% \text{ of } 5000 &= \frac{5}{\cancel{100}_{1}} \times \cancel{5000}^{50} \\ &= 5 \times 50 \\ &= 250 \end{aligned}$$

Half of 250 is 125.

**e.** **i.** The office takes up $9\%$ of the space.

$$\begin{aligned} 100\% - 54\% - 32\% - 5\% &= 100\% - 91\% \\ &= 9\% \end{aligned}$$

**ii.** The office has an area of 450 $\text{ft}^2$.

$$\begin{aligned} 9\% \text{ of } 5000 &= \frac{9}{\cancel{100}_{1}} \times \cancel{5000}^{50} \\ &= 9 \times 50 \\ &= 450 \end{aligned}$$

**11.** The loaf of bread increased in price by 134¢ or \$1.34.

$$139¢ - 5¢ = 134¢$$

The price of a load of bread has increased by $2680\%$.

$$\begin{aligned} \frac{134¢}{5¢} &= \frac{134 \times 20}{5 \times 20} \\ &= \frac{2680}{100} \\ &= 2680\% \end{aligned}$$

**b. Textbook, pages 274 to 277, "Put into Practice," questions 8 and 9**

**8. a.** One fiftieth of her crop was not harvested.

$$\frac{1200-1176}{1200}=\frac{\overset{1}{\cancel{24}}}{\underset{50}{\cancel{1200}}}$$

$$=\frac{1}{50}$$

**b.** The 1176 acres would yield 58 800 bushels.

$$50\,\frac{\text{bushels}}{\underset{1}{\cancel{\text{acre}}}}\times 1176\ \overset{1}{\cancel{\text{acres}}}=50\times 1176\ \text{bushels}$$

$$=58\ 800\ \text{bushels}$$

**c.** She was able to harvest 147 acres in one day.

$$\frac{1}{8}\ \text{of}\ 1176\ \text{acres}=\frac{1}{8}\times 1176\ \text{acres}$$

$$=147\ \text{acres}$$

**d.** She would receive \$153 615.00 for 95% of the crop at \$2.75 per bushel.

$$95\%\ \text{of}\ 58\ 800\ \text{bushels}=\frac{95}{100}\times 58\ 800\ \text{bushels}$$

$$=\frac{5\ 586\ 000}{100}\ \text{bushels}$$

$$=55\ 860\ \text{bushels}$$

$$55\ 860\ \overset{1}{\cancel{\text{bushels}}}\times\frac{\$2.75}{\underset{1}{\cancel{\text{bushel}}}}=55\ 860\times \$2.75$$

$$=\$153\ 615$$

**9. a.** Ben received $4800 for 25% of the bananas.

$$25\% \text{ of } \$12\,000 = \frac{\overset{1}{\cancel{25}}}{\underset{1}{\cancel{100}}_{\cancel{4}}} \times \$\overset{3000}{\cancel{12\,000}} = \$3000 \qquad 60\% \text{ markup on } \$3000 = \frac{60}{\underset{1}{\cancel{100}}} \times \$\overset{30}{\cancel{3000}} = \$1800$$

amount received $= \$3000 + \$1800 = \$4800$

**b.** The supermarket paid $2880 for the oranges.

$$12\% \text{ of } \$15\,000 = \frac{12}{\underset{1}{\cancel{100}}} \times \$\overset{150}{\cancel{15\,000}} = 12 \times \$150 = \$1800 \qquad 60\% \text{ markup on } \$1800 = \frac{60}{\underset{1}{\cancel{100}}} \times \$\overset{18}{\cancel{1800}} = 60 \times \$18 = \$1080$$

amount received $= \$1800 + \$1080 = \$2880$

**c.** The lettuce cost Ben $3125.

$$\begin{aligned}
\text{Ben's cost } + 60\% \text{ markup} &= \$5000 \\
c + \frac{60}{100} \times c &= \$5000 \\
c\left(1 + \frac{60}{100}\right) &= \$5000 \\
c\left(\frac{160}{100}\right) &= \$5000 \\
c\left(\frac{\overset{1}{\cancel{160}}}{\underset{1}{\cancel{100}}}\right) \times \frac{\overset{1}{\cancel{100}}}{\underset{1}{\cancel{160}}} &= \$5000 \times \frac{100}{160} \\
c &= \$3125
\end{aligned}$$

**d.** He could have donated $405.

**Bananas**

$$1.5\% \text{ of } \$12\,000 = \frac{1.5}{\cancel{100}_{1}} \times \$\cancel{12\,000}^{120}$$
$$= 1.5 \times \$120$$
$$= \$180$$

**Oranges**

$$1.5\% \text{ of } \$15\,000 = \frac{1.5}{\cancel{100}_{1}} \times \$\cancel{15\,000}^{150}$$
$$= 1.5 \times \$150$$
$$= \$225$$

His total donation is $\$180 + \$225 = \$405$.

**3. Textbook, page 378, "Put into Practice," questions 1 to 3**

**1. a.** $8\%$ of $160.00 is $12.80.

**Paper-and-Pencil Method**

$$8\% \text{ of } \$160 = \frac{8}{\cancel{100}_{5}} \times \$\cancel{160}^{8}$$
$$= \frac{\$64}{5}$$
$$= \$12.80$$

**Calculator Method**

Press the following calculator keys.


**b.** $25\%$ of $140 is $35.

**Paper-and-Pencil Method**

$$25\% \text{ of } \$140 = \frac{\cancel{25}^{1}}{\cancel{100}_{\cancel{25}_{1}}} \times \$\cancel{140}^{35}$$
$$= \$35$$

**Calculator Method**

Press the following calculator keys.

c. 40% of \$395 is \$158.

**Paper-and-Pencil Method**

$$40\% \text{ of } \$395 = \frac{\overset{2}{\cancel{40}}}{\underset{\underset{1}{\cancel{20}}}{100}} \times \$\overset{79}{\cancel{395}}$$

$$= \$158$$

**Calculator Method**

Press the following calculator keys.

4 0 2nd % × 3 9 5 ENTER =

2. a. **Paper-and-Pencil Method**

$$\frac{\overset{1}{\cancel{\$}}9.75}{\underset{1}{\cancel{\$}}65} = \frac{9.75 \div 0.65}{65 \div 0.65}$$

$$= \frac{15}{100}$$

$$= 15\%$$

\$9.75 is 15% of \$65.00.

**Calculator Method**

Press the following calculator keys.

9 . 7 5 ÷ 6 5 2nd % ENTER =

b. **Paper-and-Pencil Method**

$$\frac{\overset{1}{\cancel{\$}}39.60}{\underset{1}{\cancel{\$}}198} = \frac{39.60 \div 1.98}{198 \div 1.98}$$

$$= \frac{20}{100}$$

$$= 20\%$$

\$39.60 is 20% of \$198.00.

**Calculator Method**

Press the following calculator keys.

3 9 . 6 0 ÷ 1 9 8 2nd % ENTER =

3. a. \$495 − \$199 = \$296

$$\frac{\overset{1}{\cancel{\$}}296}{\underset{1}{\cancel{\$}}495} = \frac{296 \div 4.95}{495 \div 4.95}$$

$$= \frac{59.79\overline{79}}{100}$$

$$\doteq 60\%$$

The discount on the women's "Miranda" coat is 60%.

$\$525 - \$199 = \$326$

$$\frac{\overset{1}{\cancel{\$}}326}{\underset{1}{\cancel{\$}}525} = \frac{326 \div 5.25}{525 \div 5.25}$$

$$\doteq \frac{62.095\,238\,1}{100}$$

$$\doteq 62\%$$

The discount on the men's "Metro" jacket is 62%.

$\$425 - \$149 = \$276$

$$\frac{\overset{1}{\cancel{\$}}276}{\underset{1}{\cancel{\$}}425} = \frac{276 \div 4.25}{425 \div 4.25}$$

$$\doteq \frac{64.941\,176\,47}{100}$$

$$\doteq 65\%$$

The discount on the women's "Astoria" coat is 65%.

$\$425 - \$199 = \$226$

$$\frac{\overset{1}{\cancel{\$}}226}{\underset{1}{\cancel{\$}}425} = \frac{226 \div 4.25}{425 \div 4.25}$$

$$\doteq \frac{53.176\,470\,59}{100}$$

$$\doteq 53\%$$

The discount on the men's "Boulevard" jacket is 53%.

$\$495 - \$169 = \$326$

$$\frac{\overset{1}{\cancel{\$}}326}{\underset{1}{\cancel{\$}}495} = \frac{326 \div 4.95}{495 \div 4.95}$$

$$= \frac{65.85\overline{85}}{100}$$

$$\doteq 66\%$$

The discount on the women's "Village" coat is 66%.

$\$595 - \$229 = \$366$

$$\frac{\overset{1}{\cancel{\$}}366}{\underset{1}{\cancel{\$}}595} = \frac{366 \div 5.95}{595 \div 5.95}$$
$$\doteq \frac{61.512\,605\,04}{100}$$
$$\doteq 62\%$$

The discount on the men's "Urban Explorer" jacket is $62\%$.

**b.** The advertisement is misleading. None of the coats is at $70\%$ off.

**c.** $70\%$ of $\$495.00 = 0.70 \times \$495.00$
$= \$346.50$

$\$495.00 - \$346.50 = \$148.50$

At a $70\%$ discount, the women's "Miranda" coat would sell for \$148.50.

$70\%$ of $\$525.00 = 0.70 \times \$525.00$
$= \$367.50$

$\$525.00 - \$367.50 = \$157.50$

At a $70\%$ discount, the men's "Metro" jacket would sell for \$157.50.

$70\%$ of $\$425.00 = 0.70 \times \$425.00$
$= \$297.50$

$\$425.00 - \$297.50 = \$127.50$

At a $70\%$ discount, the women's "Astoria" coat would sell for \$127.50.

$70\%$ of $\$425.00 = 0.70 \times \$425.00$
$= \$297.50$

$\$425.00 - \$297.50 = \$127.50$

At a $70\%$ discount, the men's "Boulevard" jacket would sell for \$127.50.

$70\%$ of $\$495.00 = 0.70 \times \$495.00$
$= \$346.50$

$\$495.00 - \$346.50 = \$148.50$

At a $70\%$ discount, the women's "Village" coat would sell for \$148.50.

$70\%$ of $\$595.00 = 0.70 \times \$595.00$
$= \$416.50$

$\$595.00 - \$416.50 = \$178.50$

At a 70% discount, the men's "Urban Explorer" jacket would sell for $178.50.

## Lesson 6: Proportions

**1. Textbook, page 280, "Investigation"**

The proportion to be solved is $\frac{2.5}{3.5} = \frac{w}{17.5}$.

$$\frac{2.5}{3.5} = \frac{w}{17.5}$$

$$\overset{5}{\cancel{17.5}} \times \frac{2.5}{\underset{1}{\cancel{3.5}}} = \overset{1}{\cancel{17.5}} \times \frac{w}{\underset{1}{\cancel{17.5}}}$$

$$5 \times 2.5 = w$$

$$12.5 = w$$

The width of the enlargement would be 12.5 cm.

**2. Textbook, page 281, "Put into Practice," questions 1 to 3**

**1. a.**

$$\frac{x}{3} = \frac{\boxed{4}}{12}$$

$$3 \times \frac{x}{3} = \boxed{3} \times \frac{4}{12}$$

$$x = 3 \times \boxed{4} \div \boxed{12}$$

$$x = 1$$

OR

$$\frac{x}{3} = \frac{\boxed{4}}{12}$$

$$\frac{x}{3} = \frac{\boxed{1}}{3}$$

$$x = \boxed{1}$$

**b.**

$$\frac{y}{5} = \frac{\boxed{30}}{25}$$

$$\boxed{5} \times \frac{y}{5} = \boxed{5} \times \frac{30}{25}$$

$$y = 5 \times \boxed{30} \div \boxed{25}$$

$$y = 6$$

OR

$$\frac{y}{5} = \frac{\boxed{30}}{25}$$

$$\frac{y}{5} = \frac{\boxed{6}}{5}$$

$$y = 6$$

**2. a.** $2:5=w:20$

$$\frac{2}{5}=\frac{w}{20}$$

$$\overset{4}{\cancel{20}}\times\frac{2}{\underset{1}{\cancel{5}}}=\overset{1}{\cancel{20}}\times\frac{w}{\underset{1}{\cancel{20}}}$$

$$4\times2=w$$

$$8=w$$

**b.** $6:11=18:k$

$$\frac{6}{11}=\frac{18}{k}$$

$$\frac{6\times3}{11\times3}=\frac{18}{k}$$

$$\frac{18}{33}=\frac{18}{k}$$

$$33=k$$

**c.** $\frac{j}{3}=\frac{5}{16}$

$$\overset{1}{\cancel{3}}\times\frac{j}{\underset{1}{\cancel{3}}}=3\times\frac{5}{16}$$

$$j=\frac{15}{16}$$

**d.** $\frac{6}{9}=\frac{b}{3}$

$$\frac{6\div3}{9\div3}=\frac{b}{3}$$

$$\frac{2}{3}=\frac{b}{3}$$

$$2=b$$

**e.** $7:c=1:2$

$$\frac{7}{c}=\frac{1}{2}$$

$$\frac{7}{c}=\frac{1\times7}{2\times7}$$

$$\frac{7}{c}=\frac{7}{14}$$

$$c=14$$

**f.** $d:5=8:20$

$$\frac{d}{5}=\frac{8}{20}$$

$$\frac{d}{5}=\frac{8\div4}{20\div4}$$

$$\frac{d}{5}=\frac{2}{5}$$

$$d=2$$

**3.** The proportion to solve is $5:2=9:v$.

$$\frac{5}{2}=\frac{9}{v}$$

$$\frac{v}{9}=\frac{2}{5}$$

$$\overset{1}{\cancel{9}}\times\frac{v}{\underset{1}{\cancel{9}}}=9\times\frac{2}{5}$$

$$v=\frac{18}{5}$$

$$v=3.6$$

Gail will need 3.6 mL of vinegar.

**3. Textbook, pages 282 and 283, "Put into Practice," questions 4 to 9**

**4.** $$\frac{15}{12}=\frac{h}{3}$$

$$\overset{1}{\cancel{3}}\times\frac{15}{\underset{4}{\cancel{12}}}=\overset{1}{\cancel{3}}\times\frac{h}{\underset{1}{\cancel{3}}}$$

$$\frac{15}{4}=h$$

$$3.75=h$$

The antenna would be 3.75 cm tall in the photograph.

**5. a.** $$\frac{1}{25}=\frac{x}{87}$$

$$87\times\frac{1}{25}=\overset{1}{\cancel{87}}\times\frac{x}{\underset{1}{\cancel{87}}}$$

$$\frac{87}{25}=x$$

$$3.48=x$$

The length of the restaurant on the plan is 3.48 m.

**b.** $$\frac{1}{25}=\frac{6}{x}$$

$$\frac{25}{1}=\frac{x}{6}$$

$$6\times\frac{25}{1}=\overset{1}{\cancel{6}}\times\frac{x}{\underset{1}{\cancel{6}}}$$

$$150=x$$

$$150=x$$

The actual width of the room is 150 m.

**6. a.** $$\frac{\text{picture}}{\text{real}}=\frac{1}{6}$$

$$\frac{1.75}{r}=\frac{1}{6}$$

$$6\times\overset{1}{\cancel{r}}\times\frac{1.75}{\underset{1}{\cancel{r}}}=\overset{1}{\cancel{6}}\times r\times\frac{1}{\underset{1}{\cancel{6}}}$$

$$6\times1.75=r$$

$$10.5=r$$

The actual lobster tail should be 10.5 cm long.

**b.** $$\frac{\text{picture}}{\text{real}}=\frac{1}{6}$$

$$\frac{p}{8.4}=\frac{1}{6}$$

$$\overset{1}{\cancel{8.4}}\times\frac{p}{\underset{1}{\cancel{8.4}}}=8.4\times\frac{1}{6}$$

$$p=\frac{8.4}{6}$$

$$p=1.4$$

The claw would be 1.4 cm in the picture.

**7. a.**

$$\frac{5}{6}=\frac{x}{30}$$
$$\frac{5\times5}{6\times5}=\frac{x}{30}$$
$$\frac{25}{30}=\frac{x}{30}$$
$$25=x$$

25 of the ex-smokers enjoy their food more.

**b.**

$$\frac{5}{6}=\frac{200}{x}$$
$$\frac{5\times40}{6\times40}=\frac{200}{x}$$
$$\frac{200}{240}=\frac{200}{x}$$
$$240=x$$

There were 240 former smokers polled.

**8.**

$$\frac{13}{9}=\frac{6}{m}$$
$$\frac{9}{13}=\frac{m}{6}$$
$$6\times\frac{9}{13}=\cancel{6}^{1}\times\frac{m}{\cancel{6}_{1}}$$
$$\frac{54}{13}=m$$
$$4\frac{2}{13}=m$$

There were about 4 mL of molasses used in the sauce.

**9.**

$$\frac{5}{6}=\frac{80}{m}$$
$$\frac{6}{5}=\frac{m}{80}$$
$$\cancel{80}^{16}\times\frac{6}{\cancel{5}_{1}}=\cancel{80}^{1}\times\frac{m}{\cancel{80}_{1}}$$
$$96=m$$

You would expect that 96 males would have exercised more than 4 times last week.

## Review

**1. Textbook, page 201, "Review," questions 1.a. to c. and 3.a. to c.**

1. a.
$$\frac{1}{2} > \frac{1}{3}$$
$$\frac{1\times 3}{2\times 3} > \frac{1\times 2}{3\times 2}$$
$$\frac{3}{6} > \frac{2}{6}$$

b.
$$\frac{2}{3} < \frac{3}{4}$$
$$0.6\overline{6} < 0.75$$

c.
$$\frac{3}{5} > \frac{1}{2}$$
$$\frac{3\times 2}{5\times 2} > \frac{1\times 5}{2\times 5}$$
$$\frac{6}{10} > \frac{5}{10}$$

3. Answers may vary. Sample answers are given.

a. $\frac{1}{2}, \frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \frac{5}{10}$, and $\frac{6}{12}$ are equivalent.

b. $\frac{1}{3}, \frac{2}{6}, \frac{3}{9}, \frac{4}{12}, \frac{5}{15}$, and $\frac{6}{18}$ are equivalent.

c. $\frac{1}{4}, \frac{2}{8}, \frac{3}{12}, \frac{4}{16}, \frac{5}{20}$, and $\frac{6}{24}$ are equivalent.

**2. a. Textbook, page 202, "Review," questions 4.a. to d. and 5.a. to d.**

4. a.
$$\begin{array}{r} 1 \\ 4\overline{)5} \\ \underline{4} \\ 1 \end{array} \qquad \frac{5}{4} = 1\frac{1}{4}$$

b.
$$\begin{array}{r} 1 \\ 8\overline{)10} \\ \underline{8} \\ 2 \end{array} \qquad \begin{aligned} \frac{10}{8} &= 1\frac{2}{8} \\ &= 1\frac{1}{4} \end{aligned}$$

c.
$$\begin{array}{r} 1 \\ 3\overline{)5} \\ \underline{3} \\ 2 \end{array} \qquad \frac{5}{3} = 1\frac{2}{3}$$

d.
$$\begin{array}{r} 25 \\ 2\overline{)51} \\ \underline{4\phantom{1}} \\ 11 \\ \underline{10} \\ 1 \end{array} \qquad \frac{51}{2} = 25\frac{1}{2}$$

5. a.
$$\begin{aligned} 1\frac{3}{4} &= \frac{(1\times 4)+3}{4} \\ &= \frac{7}{4} \end{aligned}$$

b.
$$\begin{aligned} 2\frac{1}{2} &= \frac{(2\times 2)+1}{2} \\ &= \frac{5}{2} \end{aligned}$$

c. $2\frac{3}{6} = \frac{(2\times6)+3}{6}$

$= \frac{\cancel{15}^{5}}{\cancel{6}_{2}}$

$= \frac{5}{2}$

d. $3\frac{3}{8} = \frac{(3\times8)+3}{8}$

$= \frac{27}{8}$

**b. Textbook, page 202, "Review," questions 6.a. to d., 6.h. to k., and 7.a. to d.**

6. a. $\frac{1}{2}+\frac{1}{4} = \frac{1\times2}{2\times2}+\frac{1}{4}$

$= \frac{2}{4}+\frac{1}{4}$

$= \frac{2+1}{4}$

$= \frac{3}{4}$

b. $\frac{2}{8}+\frac{5}{10} = \frac{2\times5}{8\times5}+\frac{5\times4}{10\times4}$

$= \frac{10}{40}+\frac{20}{40}$

$= \frac{10+20}{4}$

$= \frac{\cancel{30}^{3}}{\cancel{40}_{4}}$

$= \frac{3}{4}$

c. $\frac{1}{4}+\frac{1}{8} = \frac{1\times2}{4\times2}+\frac{1}{8}$

$= \frac{2}{8}+\frac{1}{8}$

$= \frac{2+1}{8}$

$= \frac{3}{8}$

d. $\frac{3}{8}+\frac{1}{4} = \frac{3}{8}+\frac{1\times2}{4\times2}$

$= \frac{3}{8}+\frac{2}{8}$

$= \frac{3+2}{8}$

$= \frac{5}{8}$

h. $\frac{1}{3}-\frac{1}{4} = \frac{1\times4}{3\times4}-\frac{1\times3}{4\times3}$

$= \frac{4}{12}-\frac{3}{12}$

$= \frac{4-3}{12}$

$= \frac{1}{12}$

i. $\frac{5}{6}-\frac{2}{5} = \frac{5\times5}{6\times5}-\frac{2\times6}{5\times6}$

$= \frac{25}{30}-\frac{12}{30}$

$= \frac{25-12}{30}$

$= \frac{13}{30}$

j. $\frac{7}{8}-\frac{7}{16}=\frac{7\times2}{8\times2}-\frac{7}{16}$
$=\frac{14}{16}-\frac{7}{16}$
$=\frac{14-7}{16}$
$=\frac{7}{16}$

k. $\frac{7}{10}-\frac{69}{100}=\frac{7\times10}{10\times10}-\frac{69}{100}$
$=\frac{70}{100}-\frac{69}{100}$
$=\frac{70-69}{100}$
$=\frac{1}{100}$

7. a. $\frac{1}{3}\times\frac{1}{3}=\frac{1\times1}{3\times3}$
$=\frac{1}{9}$

b. $\frac{1}{2}\times\frac{1}{4}=\frac{1\times1}{2\times4}$
$=\frac{1}{8}$

c. $\frac{2}{3}\times\frac{4}{5}=\frac{2\times4}{3\times5}$
$=\frac{8}{15}$

d. $\frac{3}{8}\times\frac{6}{5}=\frac{3\times\cancel{6}^{3}}{\cancel{8}_{4}\times5}$
$=\frac{3\times3}{4\times5}$
$=\frac{9}{20}$

**3. a. Textbook, page 203, "Review," questions 8.a., b., e., and f.**

8. a. $\frac{1}{3}\div\frac{1}{3}=\frac{1}{3}\times\frac{3}{1}$
$=\frac{1\times\cancel{3}^{1}}{\cancel{3}_{1}\times1}$
$=\frac{1\times1}{1\times1}$
$=1$

b. $\frac{1}{2}\div\frac{1}{4}=\frac{1}{2}\times\frac{4}{1}$
$=\frac{1\times\cancel{4}^{2}}{\cancel{2}_{1}\times1}$
$=\frac{1\times2}{1\times1}$
$=2$

e. $\frac{3}{8} \div 1\frac{1}{5} = \frac{3}{8} \div \frac{(1 \times 5)+1}{5}$

$= \frac{3}{8} \div \frac{6}{5}$

$= \frac{3}{8} \times \frac{5}{6}$

$= \frac{\cancel{3}^{1} \times 5}{8 \times \cancel{6}_{2}}$

$= \frac{1 \times 5}{8 \times 2}$

$= \frac{5}{16}$

f. $2\frac{3}{8} \div 3\frac{4}{5} = \frac{(2 \times 8)+3}{8} \div \frac{(3 \times 5)+4}{5}$

$= \frac{19}{8} \div \frac{19}{5}$

$= \frac{\cancel{19}^{1}}{8} \times \frac{5}{\cancel{19}_{1}}$

$= \frac{1 \times 5}{8 \times 1}$

$= \frac{5}{8}$

**b. Textbook, page 203, "Review," question 9**

**9. a.** The total length is $1\frac{3}{16}$".

$\frac{7}{8} + \frac{5}{16} = \frac{7 \times 2}{8 \times 2} + \frac{5}{16}$

$= \frac{14}{16} + \frac{5}{16}$

$= \frac{14+5}{16}$

$= \frac{19}{16}$

$= 1\frac{3}{16}$

**b.** The total length is $6''$.

$8 \times \frac{3}{4} = \frac{\cancel{8}^{2} \times 3}{\cancel{4}_{1}}$

$= \frac{2 \times 3}{1}$

$= 6$

c. $10\frac{3}{4} \times \frac{1}{2} = \frac{(10 \times 4) + 3}{4} \times \frac{1}{2}$

$= \frac{43}{4} \times \frac{1}{2}$

$= \frac{43 \times 1}{4 \times 2}$

$= \frac{43}{8}$

$= 5\frac{3}{8}$

The half length is $5\frac{3}{8}$".

d. $10\frac{3}{4} \div 2 = \frac{(10 \times 4) + 3}{4} \div \frac{2}{1}$

$= \frac{43}{4} \times \frac{1}{2}$

$= \frac{43 \times 1}{4 \times 2}$

$= \frac{43}{8}$

$= 5\frac{3}{8}$

Each piece is $5\frac{3}{8}$".

e. You can get 5 pieces each 2" long from a $10\frac{3}{4}$" piece. The division in part d. shows 5 whole parts and a bit left over.

f. $10\frac{3}{4} \div \frac{3}{4} = \frac{(10 \times 4) + 3}{4} \times \frac{4}{3}$

$= \frac{43}{\cancel{4}_1} \times \frac{\cancel{4}^1}{3}$

$= \frac{43 \times 1}{1 \times 3}$

$= \frac{43}{3}$

$= 14\frac{1}{8}$

You can get 14 pieces $\frac{3}{4}$" long from a $10\frac{3}{4}$" piece.

g. $10\frac{3}{4} \div 2\frac{3}{4} = \frac{(10 \times 4)+3}{4} \div \frac{(2 \times 4)+3}{4}$

$$= \frac{43}{\cancel{4}_1} \times \frac{\cancel{4}^1}{11}$$

$$= \frac{43 \times 1}{1 \times 11}$$

$$= \frac{43}{11}$$

$$= 3\frac{10}{11}$$

You can get 3 pieces $2\frac{3}{4}$" long from a $10\frac{3}{4}$" piece.

**4. Textbook, pages 284 and 285, "Review," questions 3, 4, and 6**

**3.** Set up a proportion describing Margherita's situation. *x* is the amount of oregano she needs.

$$\frac{12 \text{ people}}{2 \text{ people}} = \frac{3 \text{ tbsp}}{x}$$

$$\frac{\cancel{2 \text{ people}}^1}{\cancel{12 \text{ people}}_6} = \frac{x}{3 \text{ tbsp}}$$

$$\cancel{3}^1 \text{ tbsp} \times \frac{1}{\cancel{6}_2} = \cancel{3 \text{ tbsp}}^1 \times \frac{x}{\cancel{3 \text{ tbsp}}_1}$$

$$\frac{1}{2} \text{ tbsp} = x$$

Margherita needs to use $\frac{1}{2}$ tbsp of oregano.

4. a. She should raise the temperature by 25°F.

$$350° + 25° = 375°$$

Anita should use an oven temperature of 375°F.

b. Anita should use 25% less baking powder.

$$100\% - 25\% = 75\%$$

$$\begin{aligned} 75\% \text{ of } 2 \text{ tsp} &= \frac{75}{100} \times 2 \text{ tsp} \\ &= \frac{75 \times 2}{100} \text{tsp} \\ &= \frac{150}{100} \text{tsp} \\ &= 1.5 \text{ tsp} \end{aligned}$$

Anita should use 1.5 tsp of baking powder.

6. 50 pitas use 50 times as much oil as one pita.

$$\begin{aligned} 50 \times 1\frac{1}{2} \text{ tbsp} &= 50 \times \frac{(1 \times 2) + 1}{2} \text{ tbsp} \\ &= 50 \times \frac{3}{2} \text{ tbsp} \\ &= \frac{\overset{25}{\cancel{50}} \times 3}{\underset{1}{\cancel{2}}} \text{ tbsp} \\ &= 75 \text{ tbsp} \end{aligned}$$

Alex needs 75 tbsp of oil for 50 pitas.

Set up a proportion to find the number of cups of oil, $\frac{1}{20} = \frac{x}{75}$.

$$\frac{1}{20} = \frac{x}{75}$$

$$\overset{15}{\cancel{75}} \times \frac{1}{\underset{4}{\cancel{20}}} = \overset{1}{\cancel{75}} \times \frac{x}{\underset{1}{\cancel{75}}}$$

$$\frac{15}{4} = x$$

$$x = 3\frac{3}{4}$$

Alex needs $3\frac{3}{4}$ cups of oil.

5. **Textbook, pages 286 and 287, questions 8, 9, and 11**

**8. a.** $4 \times \$7.20 = \$28.80$

A four-hour shift at \$7.20 per hour earns \$28.80.

**b.** $3\%$ of what amount is \$28.80?

$$\begin{aligned} 3\% \text{ of } x &= \$28.80 \\ 0.03 \times x &= \$28.80 \\ \frac{\cancel{0.03}^{1} x}{\cancel{0.03}_{1}} &= \frac{\$28.80}{0.03} \\ x &= \$960.00 \end{aligned}$$

**OR**

$$\begin{aligned} \frac{\$28.80}{t} &= \frac{3}{100} \\ \frac{t}{\$28.80} &= \frac{100}{3} \\ \cancel{\$28.80}^{1} \times \frac{t}{\cancel{\$28.80}_{1}} &= \$\cancel{28.80}^{9.60} \times \frac{100}{\cancel{3}_{1}} \\ t &= \$960.00 \end{aligned}$$

The total receipts would have to be \$960 for Francis to make as much as on straight commission.

**c.** On average, the restaurant makes $70 \times \$14 = \$980$ each four-hour shift. This means Francis would make a little more with the $3\%$ pay method.

**9.** The individual cost for the three items is $\$1.95 + \$1.10 + \$1.25 = \$4.30$. You save $\$4.30 - \$3.45 = \$0.85$ by ordering the special.

**11. a.** $15\%$ of $\$93.35 = 0.15 \times \$93.35$

$$= \$14.0025$$

$15\%$ of \$93.35 is \$14.00. Kevin should leave a \$14.00 tip.

**b.** $(\$6.53 \times 2) + (\$93.35 \div 100) = \$13.06 + \$0.9335$

$$= \$13.9935$$

The tip would still be \$14.00.

**c.** The advantage would be that doubling and taking $1\%$ are both easy calculations. Finding $15\%$ is slightly more difficult to calculate.

6. **Textbook, pages 288 and 289, questions 12, 14, and 16**

**12. a.** $\$11.99+\$9.99+(2\times\$2.25)=\$21.98+\$4.50$
$$=\$26.48$$

They have spent \$26.48.

$$\$26.48\times 7\%=\$26.48\times 0.07$$
$$=\$1.8536$$

The GST will be \$1.85.

**b.** The cost of the meal plus GST is $\$26.48+\$1.85=\$28.33$.

**c.** $\$35.00-\$28.33=\$6.67$

$2\times\$3.95=\$7.90$

They would not have enough money to order two desserts at \$3.95 each.

**d.** $15\%$ of $\$26.48=0.15\times\$26.48$

$=\$3.972$

$15\%$ would make the tip \$3.97. Likely they would leave a tip of \$4.00.

**e.** $\$26.48+\$1.85+\$3.97=\$32.30$

The total left in the restaurant would be \$32.30.

It would be \$32.33 if the \$4.00 tip were left. They have \$35.00. They would have $\$35.00-\$32.33=\$2.67$ left after they paid their bill.

**14.**
$$\frac{48\,000}{600\,000}=\frac{x}{100}$$

$$\overset{1}{\cancel{100}}\times\frac{\overset{8}{\cancel{48\,000}}}{\underset{\underset{1}{\cancel{6000}}}{\cancel{600\,000}}}=\overset{1}{\cancel{100}}\times\frac{x}{\underset{1}{\cancel{100}}}$$

$$8=x$$

$8\%$ of Canadian bee hives are in Fahler.

**16.** $132\,\dfrac{\text{bushels}}{\underset{1}{\cancel{\text{acre}}}}\times 160\ \overset{1}{\cancel{\text{acres}}}=132\times 160\ \text{bushels}$

$$=21\,120\ \text{bushels}$$

A quarter-section will yield 21 120 bushels of corn.

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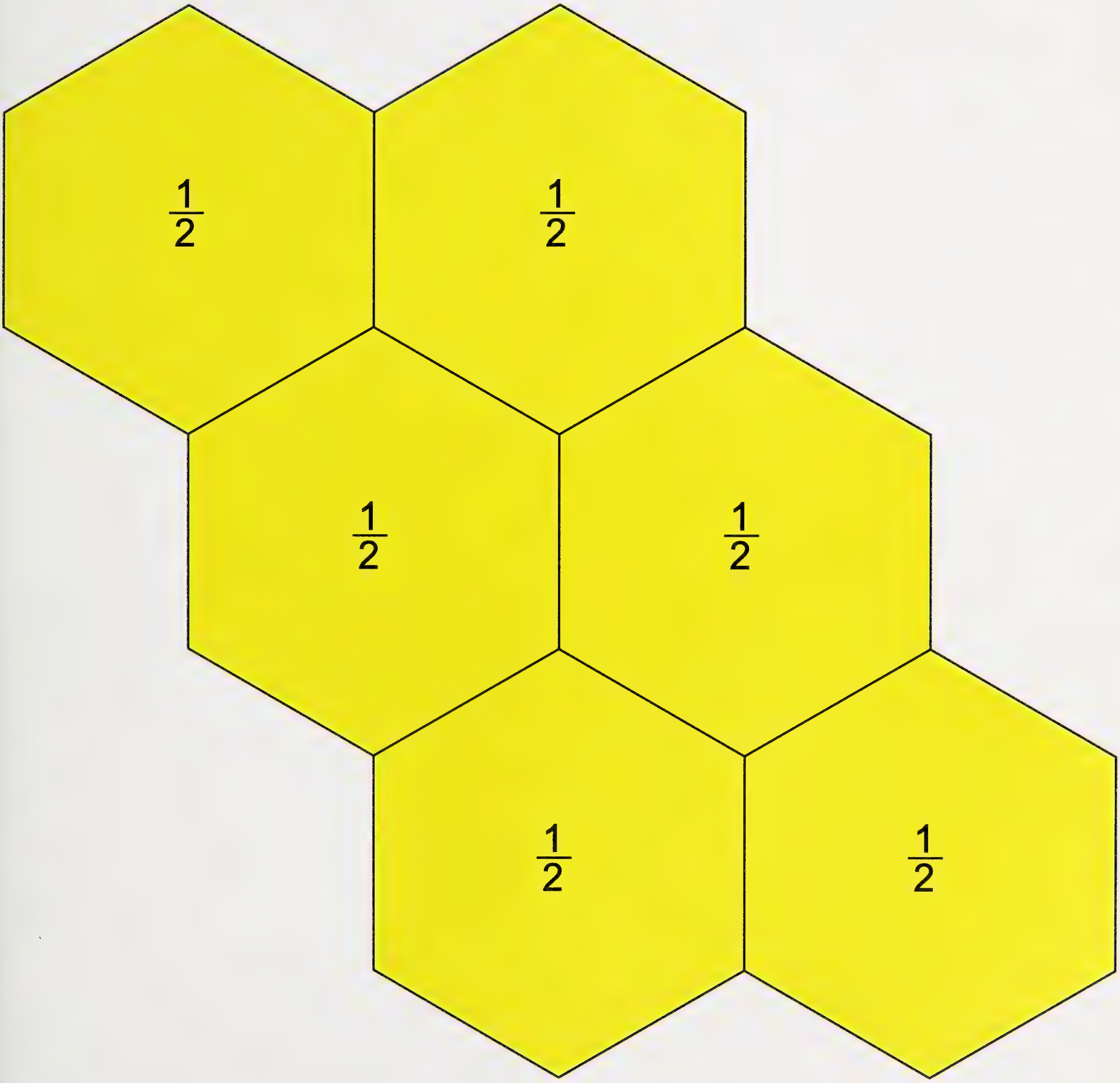
## Yellow Hexagons



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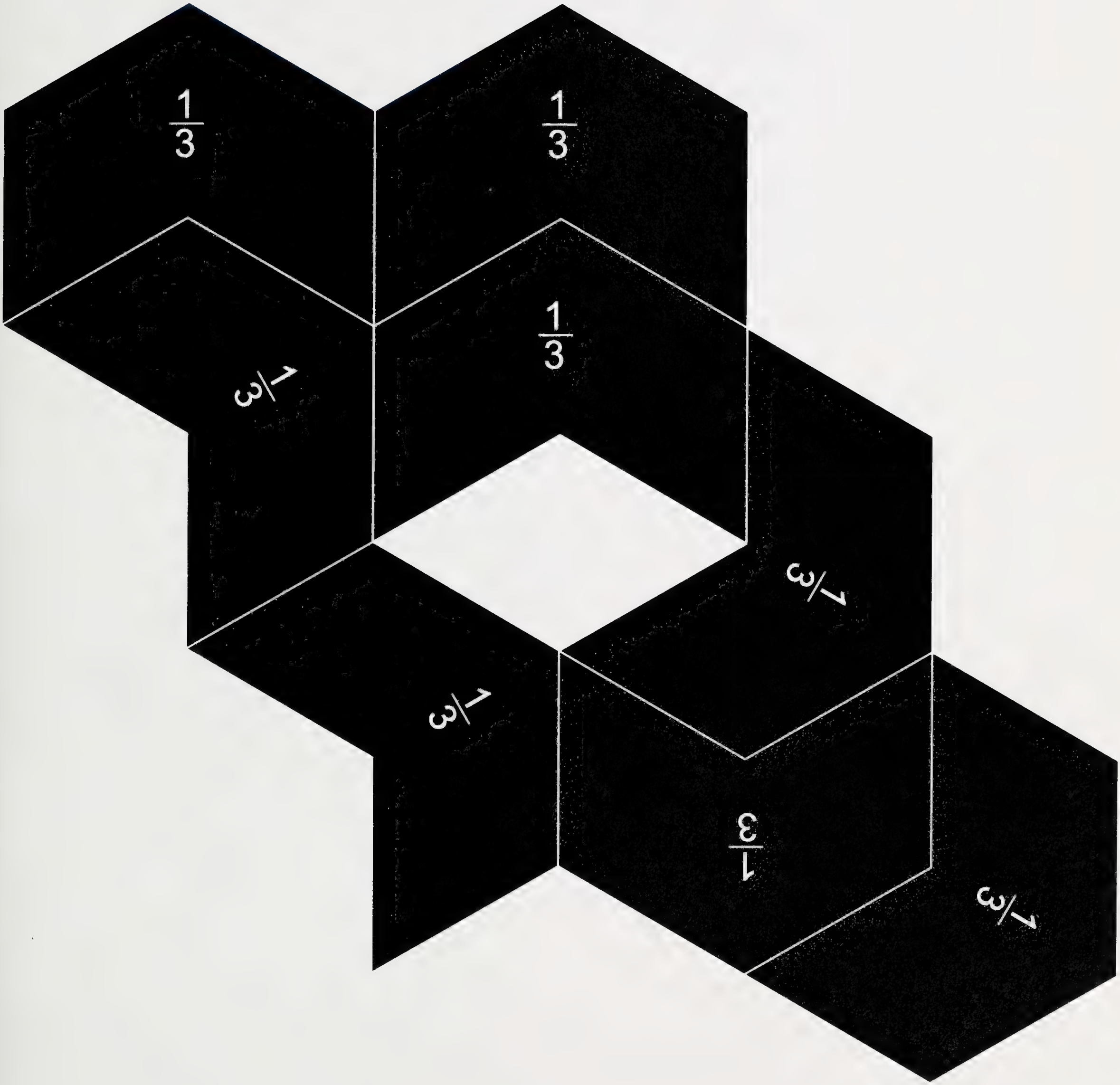

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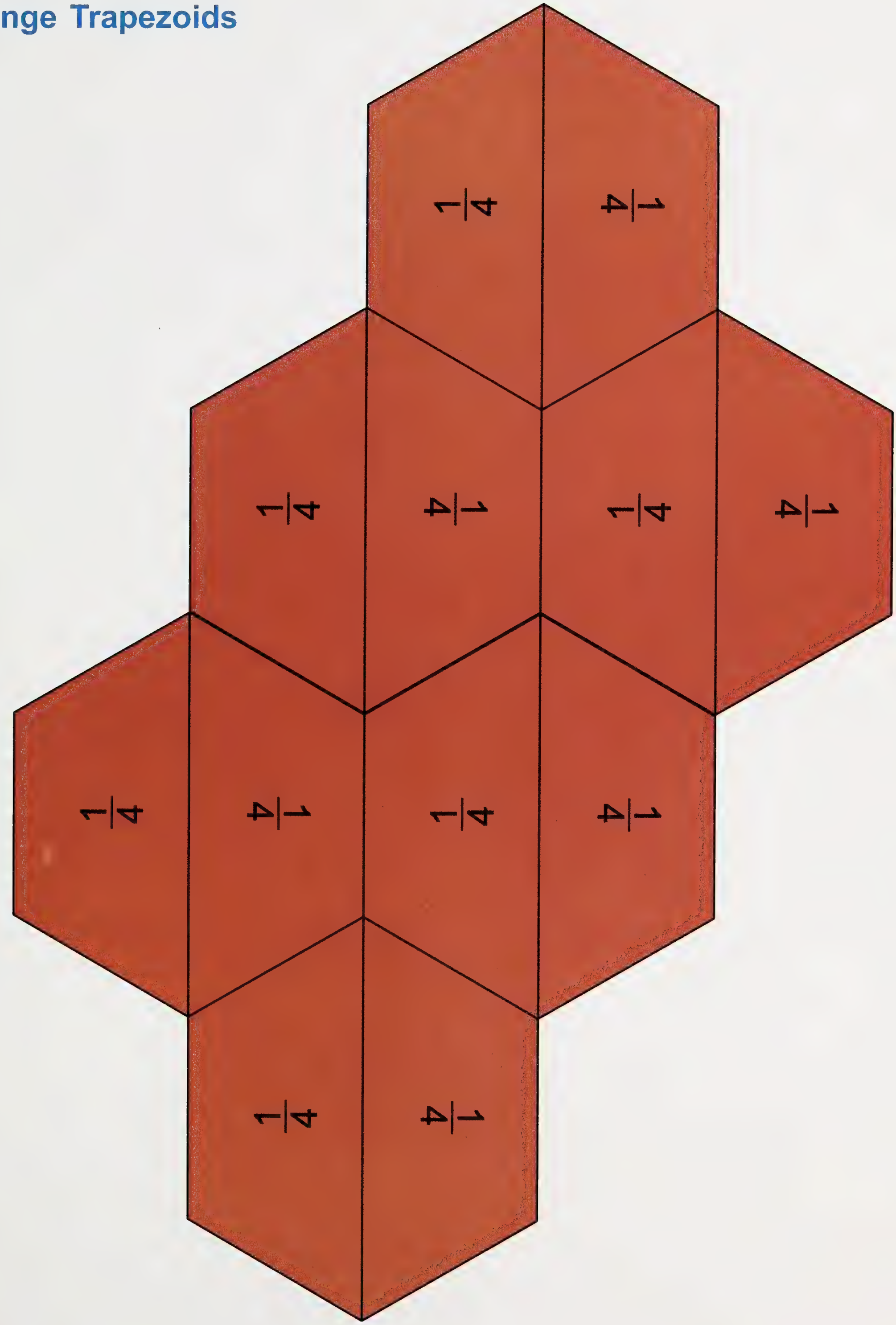
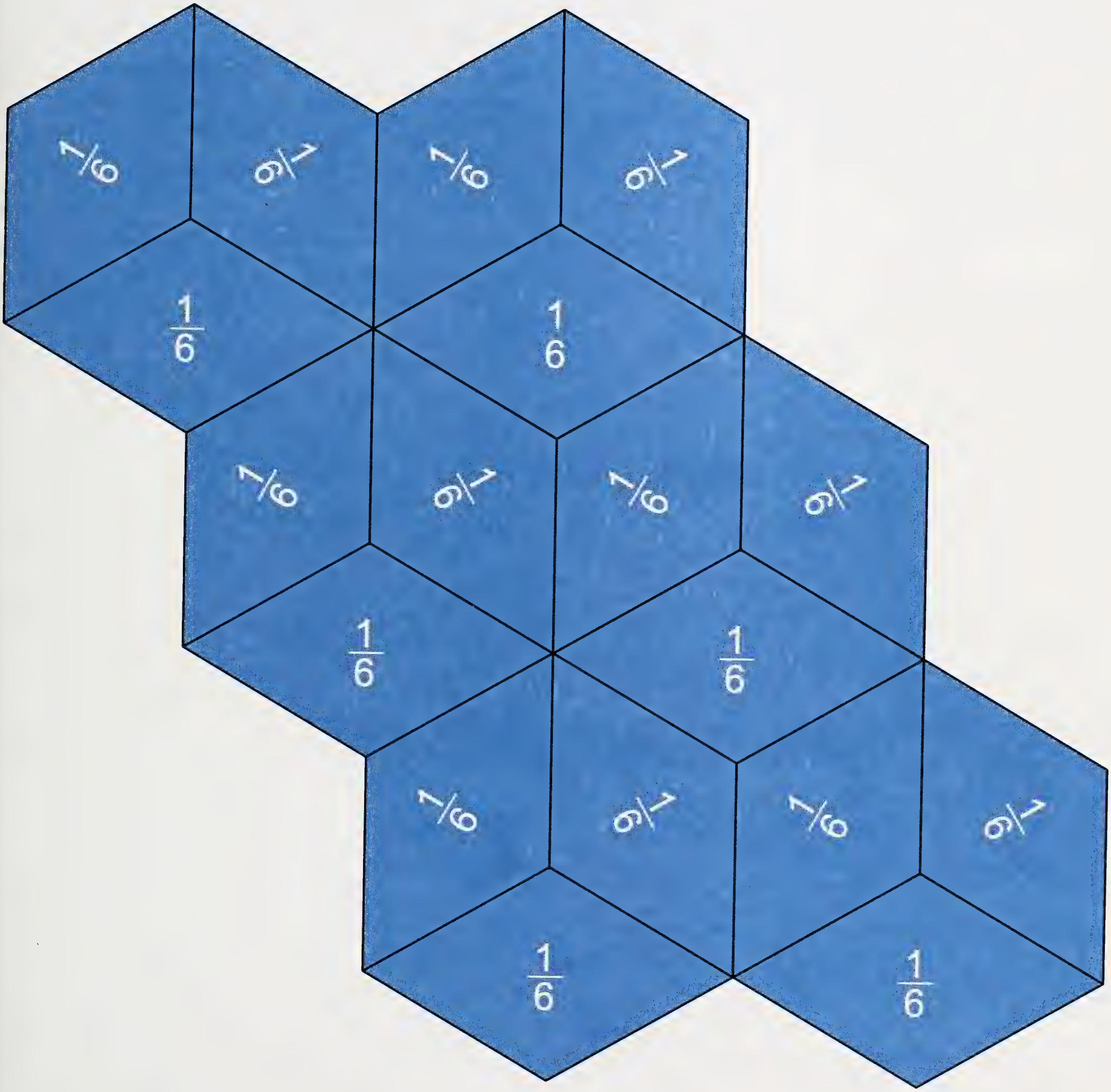


## Blue Rhombi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## Green Triangles